DEVELOPMENT OF A MODEL FOR VIRTUAL LEADERSHIP BEHAVIOR ON KNOWLEDGE SHARING IN ONLINE PROGRAMMING COMMUNITIES

ABDULRAZAK F. SHAHATHA

AL-MASHHADANI

DOCTOR OF PHILOSOPHY
UNIVERSITI UTARA MALAYSIA
2019

Awang Had Salleh
Graduate School
of Arts And Sciences

Universiti Utara Malaysia

PERAKUAN KERJA TESIS / DISERTASI
(Certification of thesis / dissertation)

Kami, yang bertandatangan, memperakukan bahawa
(We, the undersigned, certify that)

ABDUL RAZAK F. SHAHATHA AL-MASHHADANI

calon untuk Ijazah **PhD**
(candidate for the degree of)

telah mengemukakan tesis / disertasi yang bertajuk:
(has presented his/her thesis / dissertation of the following title):

"DEVELOPMENT OF A MODEL FOR VIRTUAL LEADERSHIP BEHAVIOR ON KNOWLEDGE SHARING IN ONLINE PROGRAMMING COMMUNITIES"

seperti yang tercatat di muka surat tajuk dan kulit tesis / disertasi.
(as it appears on the title page and front cover of the thesis / dissertation).

Bahawa tesis/disertasi tersebut boleh diterima dari segi bentuk serta kandungan dan meliputi bidang ilmu dengan memuaskan, sebagaimana yang ditunjukkan oleh calon dalam ujian lisan yang diadakan pada : ***23 Januari 2019.***
That the said thesis/dissertation is acceptable in form and content and displays a satisfactory knowledge of the field of study as demonstrated by the candidate through an oral examination held on: ***January 23, 2019.***

Pengerusi Viva: *(Chairman for VIVA)*	**Prof. Dr. Zulikha Jamaludin**	Tandatangan *(Signature)*
Pemeriksa Luar: *(External Examiner)*	**Assoc. Prof. Dr. Marini Othman**	Tandatangan *(Signature)*
Pemeriksa Dalam: *(Internal Examiner)*	**Dr. Maslinda Mohd Nadzir**	Tandatangan *(Signature)*
Nama Penyelia/Penyelia-penyelia: *(Name of Supervisor/Supervisors)*	**Dr. Rahayu Ahmad**	Tandatangan *(Signature)*

Tarikh:
(Date) ***January 23, 2019***

Permission to Use

In presenting this thesis in fulfilment of the requirements for a postgraduate degree from Universiti Utara Malaysia, I agree that the University Library may make it freely available for inspection. I further agree that permission for the copying of this thesis in any manner, in whole or in part, for scholarly purpose may be granted by my supervisor(s) or, in their absence, by the Dean of Awang Had Salleh Graduate School of Arts and Sciences. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made of any material from my thesis.

Requests for permission to copy or to make other use of materials in this thesis, in whole or in part should be addressed to:

Dean of Awang Had Salleh Graduate School of Arts and Sciences
UUM College of Arts and Sciences
Universiti Utara Malaysia
06010 UUM Sintok

Abstrak

Komuniti pengaturcaraan atas talian menjadi saluran yang popular untuk perkongsian pengetahuan. Walau bagaimanapun, hanya segelintir yang berjaya menggalakkan sumbangan yang aktif di kalangan ahli. Kajian terkini lebih tertumpu kepada faktor tahap individu dalam menggalakkan perkongsian pengetahuan di kalangan ahli. Namun, kajian yang menekankan faktor kontekstual seperti peranan kepimpinan adalah sangat terhad. Bagi menangani permasalahan ini, kajian ini bertujuan membangunkan sebuah model untuk mengkaji peranan kepimpinan ke arah perkongsian pengetahuan dalam komuniti pengaturcaraan atas talian. Untuk mencapai objektif tersebut, kajian tingkah laku kepimpinan maya sebagai moderator ke atas faktor kognitif individu ahli terhadap perkongsian pengetahuan telah dijalankan. *Social Cognitive Theory* (SCT) dan *Path Goal Theory* (PGT) digunakan sebagai asas bagi model yang dicadangkan. Model ini diuji secara empirikal menggunakan data yang dikumpul daripada dua puluh komuniti pengaturcaraan atas talian. Hasil kajian menunjukkan bahawa tingkah laku kepemimpinan yang berbeza bertindak sebagai moderator yang signifikan dalam mempengaruhi hubungan factor individu iaitu keupayaan kendiri dan jangkaan dapatan terhadap perkongsian pengetahuan. Dapatan kajian menunjukkan walaupun komuniti pengaturcaraan atas talian lebih bersifat tidak formal, tingkah laku kepimpinan yang sesuai dapat meningkatkan keupayaan kendiri dan jangkaan dapatan ahli untuk melibatkan diri dalam perkongsian pengetahuan. Idealnya, dengan tahap autonomi yang bersesuaian dan pengiktirafan sumbangan ahli dapat mendorong perkongsian pengetahuan secara berterusan dan mempromosikan kelestarian platform ini. Kajian ini memberikan pemahaman kepada pereka bentuk sistem untuk memasukkan beberapa ciri bagi menyokong tingkah laku kepimpinan dalam komuniti pengaturcaraan atas talian. Bagi menggalakkan tingkah laku kepimpinan serta sama, pengundian atas talian perlu disesuaikan untuk menyokong keputusan inklusif daripada ahli. Di samping itu, kebolehan pemeringkatan dan reputasi dapat memudahkan kepimpinan berorientasikan pencapaian dalam meningkatkan perkongsian pengetahuan di kalangan ahli komuniti pengaturcaraan atas talian.

Kata Kunci: Perkongsian pengetahuan, Kepimpinan maya, Komuniti pengaturcaraan atas talian, *Path Goal The*ory, *Social Cognitive Theory*.

Abstract

Despite the significant increase in the number of emerging online programming communities, very few succeed in inspiring members to share their knowledge. Recent studies have focused on personal level factors in encouraging members' knowledge sharing. However, limited studies emphasis on the role of leader. In addressing this gap, this study aims to develop a model to examine the role of virtual leadership towards knowledge sharing in online programming communities. Then in carrying out the objective, the examination of virtual leadership behaviour moderating members' personal cognitive factors toward knowledge sharing was conducted. Social Cognitive Theory and Path Goal Theory are used as the basis for the proposed model. The proposed model is tested empirically using data collected from 20 online programming communities. The result suggests that different leadership behaviors significantly moderate the effect of self-efficacy and outcome expectancy on members' knowledge sharing. This finding implies that although online communities are informal in nature, the appropriate type of leadership can boost members' efficacy and outcome expectancy to participate in knowledge sharing. Ideally, with the appropriate level of autonomy and recognition of members contributions can motivate members to continuously contribute to online programming communities and promote the sustainability of this platform. The implication of this study will provide meaningful insights for system designers to include several features to facilitate leadership behaviors in online programming communities. In supporting participative-leadership behavior, online poll and online voting need to be accommodated to allow inclusive decisions by members. Additionally, ranking and reputation features can further facilitate the achievement-oriented leadership and increase knowledge sharing among online programming community members.

Keywords: Knowledge sharing, Virtual leadership, Online programming communities, *Path-goal theory, Social cognitive theory*.

Acknowledgement

First of all, I would like to praise Allah, the most Gracious the most Merciful and thank Allah for His enormous and countless blessings and for giving me the strength and the persistence through this journey. Without Allah's grace, mercy and guidance, this work would have never seen the light or have been accomplished

I would like to thank my supervisor, Dr. Rahayu Binti Ahmad for her support throughout my journey of pursuing Ph.D. She gave me invaluable guidance, advices, inspiration, tremendous support and encouragement throughout the entire process of completing my thesis. I would also want to extend my appreciation to Dr. Kamarul Faizal Hashim for his tremendous support and guidance throughout the initial stage of conducting my study.

My thanks and prayers go to my wonderful parents, Faiek Shahatha and Ala' Abdul Razak, who sacrificed their own happiness and comfort to provide a decent life for me and my siblings. I would like to express my special appreciation to my loving wife, Nuha Khalid and my beloved children, Muhammad and Ayman who always stand beside me over my study period. My appreciation is extended to my lovely family members and friends who helped and encouraged me all the way.

My gratitude and thanks also go to Dr. Maslinda Mohd Nadzir, Asoc. Prof. Dr. Marini Othman, Dr. Mazida Ahmad and Dr. Mohd Khairuddin Kasiran for the constructive comments and invaluable suggestions during the proposal defence and Viva session to further improve this study. To all my lecturers and teachers who have helped me to reach to this level; I am in debt to you all.

Finally, I would like to thank everyone who has helped me during my studies. I owe my deepest gratitude to all of you for your patience, knowledge sharing, advice, help, time, and inspiration. This thesis would not have been possible without your help. I offer my regards to all of you.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

AOB	Achievement Oriented Behavior
AVE	Average Variance Extracted
CB-SEM	Covariance Based Structural Equation Modeling
DB	Directive behavior
F^2	Effect Size
IM	Information Management
KS	Knowledge Sharing
KSB	Knowledge Sharing Behavior
KM	Knowledge Management
OC	Online Community
OPC	Online Programming Community
PB	Participative behavior
PGT	Path-Goal Theory
PLS-SEM	Partial Least Square- Structural Equation Modeling
SB	Supportive Behavior
R^2	Coefficient of Determination
R^2 included	R^2 when all the exogenous variables are existed
R^2 excluded	R^2 when a particular exogenous variable is omitted from the model
SCT	Social Cognitive Theory
SOC	School of Computing
SPSS	Statistical Package for Social Science
TIOBE	The Importance of Being Ernest- a programming community index
UUM	Universiti Utara Malaysia
VIF	Variance Inflation Factor

CHAPTER 1 :

INTRODUCTION

1.1 Background

Online communities are groups of web users with regular interest, concerns, and activities that interact and share great amounts of resources with each other via the Internet (Preece, 2000; Schwartz & Timbolschi-Preoteasa, 2015). The communities assemble thousands of people from different nationalities, time zone, and geographical boundaries. Online communities are getting bigger each day and contribute greatly to the consumptions and generations of online content (Thackeray, Neiger, Smith, & Van Wagenen, 2012). In addition, the Web 2.0 advancement in recent years has promoted the rise of online communities. These communities rely on contributions from online volunteers to build knowledge and software artifacts (Qin, Salter-Townshend, & Cunningham, 2014). Furthermore, there are communities that focus on creating and maintaining a relationship (such as Twitter, Facebook and Snapchat), while some focus on integrating knowledge (such as Wikipedia, Citizendium and About.com). There are also online communities for creating creative work (such as YouTube and Pexels), for software and web development (such as Github, Stack Overflow, Java community and Linux community), and answering queries (such Quora.com and Stackexchange). There is a massive information load created and shared by members of these online communities. This produces millions of data and information in the form of ideas, opinions, and beliefs by these big audiences that make up the Internet.

The uniqueness of the online communities lies in their ways of challenging the conventional notion on the way of creating together. Worldwide Internet users interact and volunteer their knowledge online with each other. They also authored the biggest encyclopaedia in the globe, created prominent computer products on the market, solved major mathematical queries and generated awarding films (Wellman & Gulia, 2018), as well other things. Apart from that, online communities also unite complete strangers with similar characteristics in one place. This develops a sense of bonding and understanding among the members that are significant in encouraging individuals to share their interests and problems (Ardichvili, Maurer, Li, Wentling, & Stuedemann, 2006). Online knowledge sharing is done informally and may consist of interests, hobbies and specific skills or expertise (such programming, engineering, architecture and law) (Wasko & Faraj, 2005).

The key component of any online community is knowledge sharing. It is the ability to spread an idea or concept and shape a topic discussion. Online communities have low value without including the rich contents created by shared knowledge (Chiu, Hsu, & Wang, 2006). In knowledge sharing, interaction is essential in building the way how learning happens. Interaction helps to make tacit knowledge explicit, and this occurs frequently among community members (Al-Husseini, 2014). However, previous studies demonstrated inactive contribution in online communities (Cummings, Butler, & Kraut, 2002; Feng & Ye, 2016; Ford, Smith, Guo, & Parnin, 2016; Ghobadi & Mathiassen, 2016; Jin, Li, Zhong, & Zhai, 2015; Lakhani & Von Hippel, 2003; Mockus, Fielding, & Herbsleb, 2002) despite the rapid growth of online community and its potential for becoming a rich knowledge repository (Faraj, Jarvenpaa, & Majchrzak, 2011). This inactive contribution of members in online communities, which is a well-

known dilemma of the "tragedy of commons" indicates that many members tend to free ride rather than continually invest in the online knowledge base (Li & Qian, 2016), causes most online communities faded into obscurity becoming cyber ghost towns (Newman, Herman, Schwarz, and Nielsen, 2018).

The lack of knowledge sharing activities can be improved by the support of leadership role who are responsible to keep members engaged and involved in contributing their knowledge. Leadership role is important in stimulating communication on a particular phenomenon or topic, and moderate discussions (Rogers, Hart, & Dearing, 1997). This is known as agenda setting, where leaders in online communities post messages or videos that generate feedbacks by catalyzing discussion. Johnson, Safadi, and Faraj (2015) stated that leadership is an important component of a strong community. Leadership makes creating a great online community possible. It creates a culture of leadership by encouraging knowledge sharing with each other to sustain the community. Reviewing current studies of online community leadership, limited studies have paid attention to the effect of leadership components in an online community context (Butler, Sproull, Kiesler, & Kraut, 2002; Faraj et al., 2011; Faraj, Kudaravalli, & Wasko, 2015; Johnson et al., 2015; Zhu, Kraut, & Kittur, 2013).

Virtual leadership is unique in a sense that it does not fit neatly into any of Weber's models (Avolio, 2016). In addition, virtual leaders neither conform to traditional forms of inheriting a position of power, nor to legal authority characteristics where they are appointed or elected. Virtual leaders instead appeared in a leaderless group. What makes someone a virtual leader, remains an open research question (Johnson et al., 2015; von Krogh, Nonaka, & Rechsteiner, 2012; Yoo & Alavi, 2004). Therefore the

objective of this study is to examine different types of leadership behavior in influencing knowledge sharing in online communities.

1.2 Problem Statement

Online and offline communities are always finding new ways to inspire its followers to participate and continue contributing to their community (Abouzahra & Tan, 2014; Hashim & Tan, 2015; Moss Kanter, 1972; Olson, 1965). The failure of online communities in promoting knowledge sharing among them (Lai & Chen, 2014) caused under-contribution and inactivity problem after an extended period of time (Abouzahra & Tan, 2014; Cummings et al., 2002; Ling et al., 2005). The reason is that the communities online depend on voluntary members to survive (Wang & Lantzy, 2011). Spreitzer (1995) and Thomas and Velthouse (1990) state that in many online communities, under-contribution is a major concern. Ghobadi and Mathiassen (2016) stated that there is low contribution ratio in which developers contribute in only few projects in online programming communities and open source software communities. In addition, only a small population contribute to online programming communities, such as in Stack Overflow, Apache and Usenet communities (Cummings et al., 2002; Ford et al., 2016; Lakhani & Von Hippel, 2003).

Another issue plaguing online communities is the ability to attract and retain members who contribute their knowledge (Ma & Agarwal, 2007; Ransbotham & Kane, 2011). Previous studies shows that the high turnover of online community members, where members leave the communities after a single post (Arguello et al., 2006) or after a day (Dabbish, Farzan, Kraut, & Postmes, 2012). In addition, Qin et al. (2014) demonstrate despite the success of a few communities, such as Linux, Apache, Wikipedia and OpenStreetMap, many of them fail to generate desired outcomes. Studies also estimated

that 82% of support software communities participants are inactive (Preece, Nonnecke, & Andrews, 2004). These problems lead to many online communities fail to generate desired outcomes that lead to many of the members getting into withdrawal (Faraj et al., 2011; Qin et al., 2014).

Since online communities benefit members through communication and collaboration, existing members withdrawal will disrupt the functionality of online communities, because prior knowledge generated by the community will remain idle or lost. Without the capability to maintain knowledge in online community, the community's cooperative input becomes a strange path, just as important than the knowledge of recent staff. (Ransbotham & Kane, 2011).

In online communities, all contributors are valuable, but the irregular participation of the many will cause domination of ideas from the few. This will affect the resources availability and leave the community vulnerable to dormancy (Wang & Lantzy, 2011). Nonetheless, there is an undisputed advantage of online communities, even for those who choose to leave. Everyone will eventually have unique knowledge and social relationships gained from the communities.

This problem caught the attention of many researchers who then started studying the factors that affect knowledge-sharing, which are motivation (Huffaker & Lai, 2007; Limpisook, 2009; Ma & Yuen, 2010; Suh & Shin, 2010), attitude (Chang, Hsu, Liao, & Lin, 2013; Huang, Ting, & Chou, 2014; Papadopoulos, Stamati, & Nopparuch, 2013; Sheng & Hartono, 2015; Tseng & Kuo, 2014) and cultural (Ardichvili et al., 2006; Li, 2009; Li, Ardichvili, Maurer, Wentling, & Stuedemann, 2007).

Apart from those personal level factors, context such as virtual leadership plays a role too. Hew and Hara (2006) argued that leadership aids knowledge sharing. The

leadership role is crucial because it acts as a sieve that keeps the communication focused on issues related to the objective of the community. According to Bradshaw, Chebbi, and Oztel (2015), leadership has an essential move in promoting knowledge sharing behavior. This is done by maintaining current members and encouraging them to remain consistently sharing their knowledge and experience with others.

Previous researches focused mainly on identifying the leaders in online communities and the different languages used by leaders from other community participants (Faraj et al., 2015; Johnson et al., 2015; Zhu et al., 2013). There are also limited studies on the effect of leadership components in an online community context (Butler et al., 2002; Faraj et al., 2011; Faraj et al., 2015; Johnson et al., 2015; Zhu et al., 2013).

Furthermore, analyzing how leadership behaviour interacts with personal cognitive factors (namely self-efficacy and outcome expectancy) of online community members is crucial in understanding the ways to encourage intellectual contribution (Tseng & Kuo, 2014). Consequently, this will increase participation in knowledge sharing in online programming community and help researchers to determine which leadership behavior that influences people best. Faraj et al. (2015) concluded that the key questions regarding leadership in online communities' engagement remains unsettled and called for more studies on the attributes of leadership within an online context. Hence, this study aims to identify different types of virtual leadership behaviour. Additionally, the interaction of personal cognitive factors with leadership behaviour in one model is developed.

1.3 Research Questions

1) What are the virtual leadership behaviors that influence knowledge sharing behavior?
2) What are the personal attributes that influence knowledge sharing in online programming community?
3) How can personal attributes influence members' knowledge sharing in online programming communities?
4) How can virtual leadership behaviors influence knowledge sharing in online programming communities?

1.4 Research Objectives

1) To identify types of leadership behaviors in online programming community.
2) To determine personal attributes that influence knowledge sharing in online programming communities.
3) To examine the influence of personal attributes on knowledge sharing in online programming communities.
4) To develop a model demonstrating the influence of leadership behaviors on knowledge sharing in online programming communities.

1.5 The Significance of the Study

This study expands the body of knowledge in online knowledge sharing by incorporating personal cognitive factors and virtual leadership behaviors. In turn, this will contribute to the development of a deeper comprehensive knowledge sharing model in the online programming community.

Apart from that, this study explores the compatibility of Path-Goal Theory with Social Cognitive Theory, where it emphasizes the positive effect of virtual leaders towards members' knowledge sharing. Such knowledge is pertinent in maintaining active participation and avoid members turnover. Furthermore, this study provides sound suggestions to increase knowledge sharing, to encourage and ensure involvement in online programming communities with appropriate leadership behavior. On top of that, this study is distinctive by aiming on the leadership behaviour influence on knowledge sharing.

The model developed might assist community managers and profounder in formulating guidelines that would encourage knowledge sharing. This study may also support the community managers and moderators by assisting the members in contributing and being an active participant in the online programming community. Moderators can gain valuable insights on the ways to motivate and retain members that will, in turn, enrich the body of knowledge. This study also could help designers to develop and improve the design of online programming communities by including several features to facilitate several leadership behaviour. In supporting participative-leadership behavior, online poll and online voting need to be accommodated to allow inclusive decisions by members. Additionally, ranking and reputation features can further facilitate the achievement-oriented leadership and increase knowledge sharing among online programming community members.

1.6 The Scope of the Study

The participants of this study are current and active members of the top 20 online programming languages community listed in the TIOBE index (The Coding Standard Company). TIOBE index stated by previous studies as the most popular index for

ranking programming languages among other online programming communities like GitHub, tag rankings in Stack Overflow, TIOBE programming community index (www.tiobe.com/tiobe-index), and PopularitY of Programming Language index (pypl.github.io/PYPL.html) (Diakopoulos, Cass, & Romero, 2014; Kim & Ko, 2017). As mentioned before, this study draws on both Path-Goal theory and Social Cognitive theory to investigate and explain the effect of personal cognitive factors (self-efficacy and outcome expectancy) on knowledge sharing behavior. This study also evaluates the moderating effects of the four dimensions of virtual leadership behavior (such as supportive leadership, participative leadership, achievement-oriented leadership, and directive leadership) on the relationship between independent variables (such as self-efficacy and outcome expectancy) and dependent variable (knowledge sharing behavior).

1.7 Outline of Thesis

This thesis is organized into six chapters. The following are each chapter's brief explanations.

Chapter 1 begins with the background of the study by highlighting leadership behaviors and knowledge sharing, the importance of the research along with its theoretical underpinnings. There are also descriptions of online programming community, which is the domain of the study. Problem statements of this study are discussed. The study's objectives and research questions are addressed, followed by a methodology overview. This chapter also explains the significance and the scope of this research.

In Chapter 2, comprehensive assessment of the previous literature discussion on an online community, knowledge sharing, and virtual leadership behaviour. There is also

a literature analysis conducted to comprehend the state of the study within an online community context. Discussion of determinants which significantly affect the behavior of knowledge sharing in both physical and online settings is also discussed. The literature gaps are identified based on the analysis of the literature.

Chapter 3 examines the literature on the two fundamental theories used in this study (i.e., SCT and PGT). Four research questions are deduced from the discussions and research hypotheses in relation to research questions are developed. Furthermore, this chapter also elaborate the relationships among independent variables, dependent variables, and moderating variables. A conceptual model of research is developed on the basis of research questions and research hypotheses.

Chapter 4 describes and discusses the research design and research process. The survey processes are described in detail. The structural equation modeling is conducted to come out with the measurement and structural model that used for analyzing the data. Instrument design approach is also conducted. In addition, the final survey of the preliminary details are also presented.

In Chapter 5, data analysis bordering on initial screening of data and preliminary analysis, inferential analysis and descriptive analysis using both SPSS version 21 and Smart PLS 3.0 M3 software were conducted. To examine the hypotheses proposed of structural model and complementary PLS-SEM analysis involving testing of moderating effects in the structural model were examined.

The findings are discussed in Chapter 6. This chapter answers all research questions. The hypothesis are also discussed and justified. The contribution of the study (practically and theoretically) are presented. In this chapter also, the limitations of the

research are highlighted, the guidelines are discussed and provided for work to be conducted for the future.

CHAPTER 2 :

LITERATURE REVIEW

2.1 Overview

This chapter discusses some of the literatures that are already published regarding online community, leadership, and knowledge sharing. This section will evaluate and build a thorough knowledge of the influence of leadership behavior toward knowledge sharing in online communities. The first part of this literature review will discuss the definition of a community, a traditional community, and an online community. Following the nature of this study, this section will define and conceptualize knowledge sharing. We will also discuss the importance of knowledge sharing in online communities. Apart from that, the concept of leadership will also be defined and evaluated, together with its importance. There will also be some analysis done on previous works on the effect of leadership behavior in knowledge sharing within an online community. This study also will discuss on leadership theories and why Path-goal theory is selected for this study among other theories. Moreover, Since this research focuses on online communities, it is logical to define the concept of a community and the flow of knowledge sharing in formal and informal structures. We shall begin by discussing the general concept of a community, followed by a detailed discussion on online communities and leadership behaviors role in the online programming community.

2.2 Defining a Community

A community can be seen as a driven phenomenon rather than something that happens without any stimulant (Lechner, 1998). Chavis, Hogge, McMillan, and Wandersman (1986) described a community as the feeling of belonging where members believe that they are matter to one another and to the whole group. In addition, those who share similar faith, needs and desire will have a sense of commitment to each other. This shared connection between those individuals forms a community that consists of people of similar interests. Members and leaders bond together by a shared interest in understanding and improving their practice and interest.

Moving on, the initial conceptualization of community is proposed by Kaufman (1959). Kaufman distinguished community in terms of two ideologies. The first ideology defines a community as homogeneity, face-to-face contact that emphasizes the bond between individuals. The second ideology refers to a cosmopolitan community, categorized by mass contacts and anonymity. This is arguably more demonstrative of communities that display shared connection. Contemporary online communities typically display the cosmopolitan and homogeneous characteristics of both ideologies. This created a third ideology which is a hybrid of the two other ideologies. This particular ideology describes a community that is homogeneous in purpose, has a dynamic mass membership, and is participatory. Nonetheless, such community lacks the traditional component of personal face-to-face contact.

Furthermore, Duncan-Howell (2007) has examined previous studies that define 'community'. He outlined four components of the community that are derived from sets of complex components and provided a clear definition of a community. Figure 2.1 demonstrated the components of collective, operational, personal, and manifest.

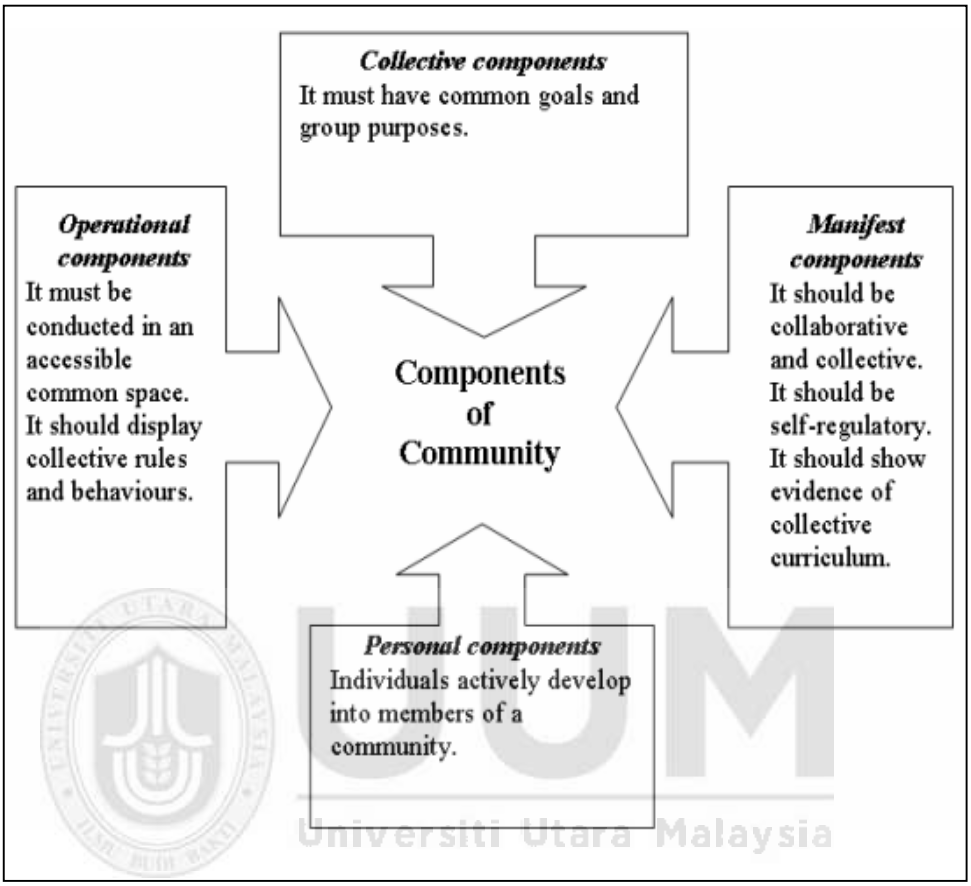


Figure 2.1. A Simplified Model of a Community and its Components

Source: Adopted from Duncan-Howell (2007)

Interest in the concept of communities has surged due to increase of the complexities of globalization and the needs to work, manage, and share knowledge more efficiently in new and uncharted situations (Kimble, Hildreth, & Wright, 2001; Wenger, McDermott, & Snyder, 2002).

According to Wenger, McDermott, & Synder (2002), community members are individuals who gather in groups and are bound formally by shared expertise, passion, and interest. These individuals also communicate, discover things and learn together.

They form connections, establish a mutual commitment, and attempt to fit into a particular community. These exchanges of ideas and views will indirectly create a social learning system.

Apart from that, Riel (2004) stated that community members share opinions, tasks, and activities. Members of a community are usually keen on exchanging ideas with those who are equally passionate about particular topics or interests. They also value different ideas, opinions, and strategies that can potentially assist each other in performing their own tasks. As identified by Riel and Polin (2004), activity and a sense of association are important components of a community. These activities are mainly inspired by the possible enhancement of knowledge in specific domains.

Moreover, Wenger (1998) classified communities according to their domain, community, identity, and agency. Riel (2004) and Wenger (1998) observed how a community become a place where people with similar passions gather and discuss their interests. These motivated individuals regularly interact to gain new knowledge and sharpen their skills. These observations made by previous literature show that online community may reduce a member's feeling of disconnectedness, isolation, and loneliness. Online communities cut geographical barriers. This is one of the uniqueness of online communities that may wield a stronger bond between members (Gray, 2004). The rise of the Internet and Web 2.0 (Tapscott & Williams, 2008) is directly proportional to the increase of interest in online communities (Kimble et al., 2001; Kondratova & Goldfarb, 2004). Some of the reasons for this rise are cost-effective operational modalities, resource-smart, satisfying and online communities typically appeal to organizational leaders who want to work smarter (Tapscott & Williams, 2008).

To conclude, a community is dependent on the shared connection between members and the interaction of collective, operational, personal, and manifest components. The following section discusses the concept of an online community domain.

2.3 Online Community

In the 21st century, the Internet is not only used to share information. It is a social technology that connects individuals with common interests and provides them with a platform to share information and support each other without any physical contact and geographical boundaries (Li, Yan, & Song, 2015). It is interesting to observe how this new social technology diversifies online communities. A group of individuals who share similar interests and trade information through the Internet is referred to as an online community or a online community (Rheingold, 2000).

According to Apostolou, Belanger, and Schaupp (2017), online communities are groups of web users with regular interest, concerns, and activities. These users interact and share a great number of resources with each other through the Internet. They also create and spread knowledge and information with each other, The result is huge amount of data and information and more significantly ideas, opinions and the beliefs of the massive Internet audiences are shared (Horrigan, 2001). There is a sense of community in an online community. Such bond focuses on cultivating strong relationships that include attachment, influence, belonging, fulfilment, and deep sentimental relationship (Blanchard, 2004; Blanchard & Markus, 2004). Previous studies classify online communities as an egalitarian space that assists information exchange and provides individual support (Baym, 2000; Rheingold, 2000; Wellman & Gulia, 1999). Online communities have an increasing presence in the workplace (Wallace, 2004) and educational settings (Freeman, Patel, Routen, Ryan, & Scott, 2013; Pittinsky, 2003) as they are useful in supporting learning, collaboration, and innovation (Alavi, 1994;

Kouzes, Myers, & Wulf, 1996). As such, comprehending these components of social behavior in online communities will offer valuable insights.

2.3.1 Differentiating between a Traditional Community and an Online Community

Online communities use the Internet to collaborate and get acquainted with each other without time-zones and geographical barriers. These communities differ from traditional communities in several aspects. Traditional communities typically focus on membership location. It is arranged according to the norms and dynamics of a group, which often predominate individual expressions (Palloff & Pratt, 1999). There is also a clear distinction between membership statuses. Meanwhile, online communities are based on self-identification of a task or an idea, rather than one's physical location. These communities are arranged according to current activity and are flexible to changes (Squire & Johnson, 2000). Squire and Johnson (2000) noted that the lack of norm adherence in online communities caused the absence of boundaries in online communities. The lack of personal interaction also creates greater individual control (Palloff & Pratt, 1999).

Furthermore, the fluidity of online communities allows members to share their insight. This is demonstrated in Figure 2-2. This structure is distinguishable from traditional organization's structure as it has a more dynamic virtual space. Fluidity in a structure distinguishes permeable boundaries in highly flexible online communities, making it difficult to evaluate membership status (Preece et al., 2004).

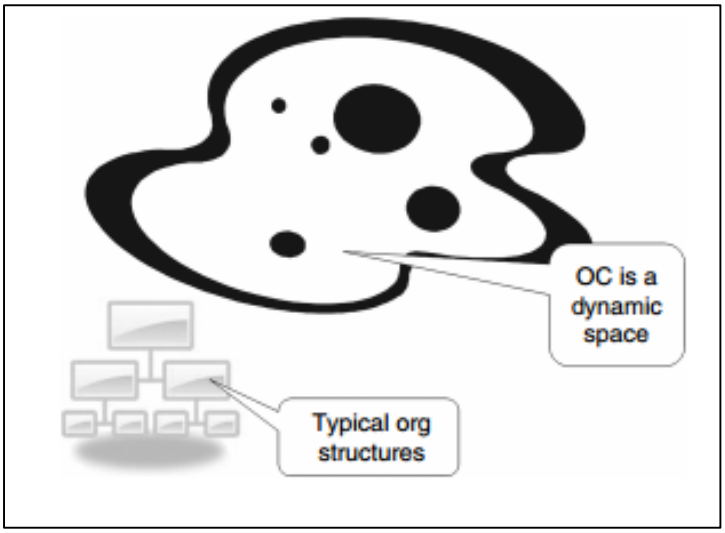


Figure 2.2. Online Community as a Fluid Object
Source : (Faraj et al., 2011)

According to Palloff and Pratt (1999), constructing online community is by defining the purpose of the community and make a place for the community members to gather. Subsequently, define norms and set of conduct. This allows community members to resolve conflicts by themselves.

In reality, in online community compared to traditional community, there is no personal communication among members. Online community has a formalized arrangement to organize the structure of learning activities where members move throughout different development levels after joining in knowledge acquisition and learning (as belonging, doing and becoming experience members).

Communication, interaction, production and coordination among members in online communities are different than physical meetings (Evans & Wurster, 1999). Nonetheless, individuals still engage with other members and form thousands of online communities'. The topics can range from business, technical, recreational, entertainment, political to discussion forums, chat, Usenet and other community platforms. These communities demonstrate a shift in what is considered as a community

from individuals who share the same place to those who share similar interests (Wellman & Gulia, 1999).

2.3.2 Online Community Membership Life Cycle

Sonnenbichler (2010) observed that beginners of an online community begin as visitors or lurkers. After they successfully pass a certain level, they become novices and begin to participate in the community. These individuals then become active members by actively contributing for a certain period of time. Those who stay active and pass a set of standards become leaders, and gradually become elders. Such lifecycle is observed in many online communities. Furthermore, one of the main concerns of a modern online community is getting and retaining members. An organized and structured membership will help define, compare, and analyze the inner structure of an online community. Actions can then be taken to change the existing structure into the target structure.

Moving on, a generic online community by Sonnenbichler (2010) is depicted in Figure 2-3 below. Newcomers in online communities are called visitors and they will then become novices. Novices can become active members, passive members, or trolls. After some time, active members may become leaders, passives, or trolls. Leaders can also become passive or trolls. In a similar idea, passive members may become active again. A role of members is given in Figure 2-3.

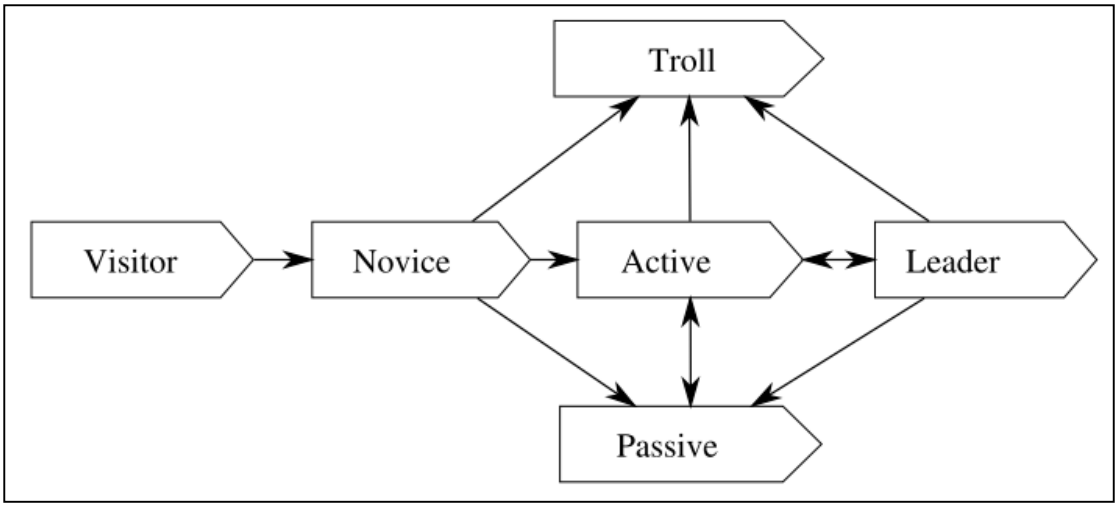


Figure 2.3. A Community Membership Life Cycle Model
Source: (Sonnenbichler, 2010)

Visitors: A new member is usually a visitor who has not signed up. He does not have account or identification in the community. He may a faint idea on the topic discussion or some members, depending on his initial information of the particular community (Sonnenbichler, 2010).

Novices: A person who signs up is known as a novice and the community will recognize him by his nickname. Novices are usually willing to be introduced to a discussion or other people in the communities. They will take notes of the rules (explicit and implicit) and acceptable behaviors. In addition, novices may also cultivate a bond with other community members. After some time, a novice may decide to become an active member, a passive member, or leave the community.

Actives: These members actively participate within the community. They are the backbone of an online community and play an active role as both consumers and producers (Sonnenbichler, 2010). Actives engage in contents created by others such as articles, posts, pictures, and videos and contribute some contents themselves. They also

build up a social network in online communities by making contacts with other members.

Leaders: Leaders are those who moderate discussions, run communities, plan events, and technically administrate communities. They contribute actively in media, content, and discussions. Due to their activity level, they have strong networks that they maintain and grow. Apart from that, they are the community experts who recognize members, content, and techniques. Leaders usually have high interest and commitment toward a community. They want the community to expand and be constantly active.

It is worth noting that leaders can also become passives if they lose interest or purposely choose to become regular, active members. They may also leave the community. Nevertheless, it is rare for a leader to quit without any notice due to the relationship between the leader and community members.

Passives: A passive member has a lower activity level compared to actives and leaders and they certainly have higher numbers than active members. Passive members are considered as silent supporters that are interested in the news, topics of discussion, and members of the communities. Nonetheless, they prefer to stay in a loose contact. It is expected of them to not be as active as others. These members may become active contributors if they are motivated, and they may also leave the community if they lose interest.

Trolls: Trolls are the negatives and troublemakers of online communities. Most typical cases of trolls include anonymous individuals who intend on disturbing other members in the community. They spam, abuse, provoke, comment or post improper messages,

pictures, or other forms of media. Some of them also create multiple user accounts, especially if they damage their reputation and identified as trolls.

Table 2-1 : Overview of Community Membership Life Cycle Roles

	Description	Identification	Succesor Roles
Visitor	Interested in topics and/or members, information consumer	anonymous, did not sign up	Novice
Novice	Wants to get introduced to people, rules and topics. Mainly information consumer, partly producer	Short time since sign up	Active, Passive, Troll
Active	"Heart" of the community, information consumer and producer, active participation	average degree centrality, average periods between logins	Leader, Passive, Troll
Leader	Very active contributor, strong personal network, opinion leadership, trend setter	high degree/closeness/ betweenness centrality, short periods between logins	Active. Passive
Passive	Low level of activity, friend of the community, mainly information consumer	varying centralities (depeding on previous roles), long periods between logins	Active, Troll
Troll	Wants to disturb the com– munity, very active in a short time period, mainly information producer	high outdegree of relations, not many dyadic relations, activity peaks	none

Source: (Sonnenbichler, 2010)

2.3.3 Online Programming Community

Online programming communities is a place where programmers with regular interest in programming and development skills interact and share their resources with each other via the Internet (Schwartz & Timbolschi-Preoteasa, 2015). The use of online programming communities is increasing daily, and the members of these communities spend a significant amount of time in producing and consuming online contents

(Thackeray et al., 2012). Online programming communities are also becoming knowledge hubs, with knowledge being exchanged through computer-mediated connection and relationships built. (Koh & Kim, 2004).

Apart from that, individuals have been using the Internet to collaborate and create in ways that are impossible before. These individuals may be geographically distributed and may be on the opposite ends of Earth, but they are brought together by technology. It is interesting to note that these groups of individuals are comprised of professionals and amateurs who are able to utilize each other's expertise, interests, and available time to make meaningful contributions (Benkler, 2006). Most of them are unpaid volunteers who are motivated by others, affinities for their communities, the desire to learn, anticipated reciprocity, and altruism (Kollock, 1999; Ye & Kishida, 2003).

The results of these new collaboration models can be profound and world-changing. One of the best-known examples is the open-source software (OSS) movement. Most OSS developers are geographically dispersed, but they gather online and volunteer their time and effort to create new and high-quality software. Their work is often supported by a larger community of users who report bugs and request features. On top of that, any content created through OSS is freely available. There are a number of positive stories involving OSS that enriches life of people and this settings also being accessed and used to program different type of applications that leads to an invention of a new products. Around 20 million people use Ubuntu, an open-source operating system based on Linux (Luther, 2012). In addition, more than 60% of all websites run on the open-source Apache HTTP Server (Luther, 2012) and nearly a quarter of web users use the open-source Mozilla Firefox browser (Choi, Chengalur-Smith, & Nevo, 2015). Also, one in five new websites runs on the open-source blogging platform WordPress (Phillips, 2017). That makes more than 75 million sites, 31% most popular usage in

total. There are many other popular software products written in open-source programming languages such as Java, PHP, and Perl.

The success of Wikipedia and OSS challenges conventional understandings on the ways to complete a task. Researchers are particularly interested in associating their success with the theories of offline human behavior. Some scholars have suggested that these communities demonstrate a new method of collaboration. Benkler (2006) argued that Wikipedia and OSS represent a "third mode" of *common peer production economic output*. Peer production relates to the successful collaboration among community members in completing projects through diverse social signals and motivational drives, rather than through managerial commands and market price (Benkler, 2006). A basic understanding of the knowledge sharing process will assist in increasing contribution and knowledge sharing among voluntary members in online programming communities.

2.4 Knowledge Sharing

Many researches have attempted to reach a comprehensive definition of knowledge sharing. Lee and Hawamdeh (2002) stated that the definition of knowledge sharing is a thoughtful and attentive act where reusable knowledge is transferred from one party to another. Meanwhile, Bordia, Irmer & Garden (2004) define knowledge sharing as a behavior opt by an individual who may recognize the reward system associated with it. They also observed that collective knowledge sharing can promote and increase an organization's performance.

Knowledge sharing is the fundamental of cooperative benefit that relies on an individual and the organization's activity, and it is significant to avoid "reinventing the

wheel" (Lee, Foo, Chaudhry, & Hawamdeh, 2004). This type of communication to ensure innovation, cultural stability and prevent the loss of knowledge if an expert leaves. Studies have shown that knowledge sharing is a complex concept. This complexity is because of the disagreements in knowledge sharing process, knowledge types, and the ambiguity of the concept itself. In addition, certain people do not want to contribute and share their thoughts that is deemed important or valuable (Davenport & Prusak, 1998). This occurs in a competitive environment to maintain provenance and communities ' accessibility (Andrews & Delahaye, 2000).

people's tendency to share knowledge, expertise, experience, and information with others is important for the organization (Kim & Lee, 2006). Previous studies demonstrate where the achievement of an institution's knowledge sharing dependent on trust, social process, previous experience, tight coupling, and codification of information (McNeish & Mann, 2010), availability of knowledge sharing strategy infrastructure like IT (Martín-de Castro, López-Sáez, Delgado-Verde, Donate, & Guadamillas, 2011), organizational context, culture and structure (Kim & Lee, 2006), expert insight (Santosh & Muthiah, 2012), and motivation (Lam & Lambermont-Ford, 2010).

Furthermore, knowledge sharing creates a community that fosters identity, learning, and commitment. Nonetheless, some individuals are not "benevolent co-operators" who would voluntarily and enthusiastically share their private knowledge (Lam & Lambermont-Ford, 2010). An individual's knowledge is a beneficial asset for the public only when it is shared.

2.4.1 Knowledge Sharing and Community

Community members interact and share a repertoire of resources with each other in a shared domain. While ideas are created individually, communication with other

members helps to nurture those ideas. Nonaka (1994) named this occurrence "communities of interaction", referring to the contribution made by community members to the strengthening and development of new knowledge.

Moreover, communities can discover new knowledge by sharing resources such as experience, problem-solving materials, stories, helpful tools, and others. Collaborative groupware such as Groupsite can be used to overcome spatial and temporal barriers. Such platform can also create a space for members to interact and build a common ground. This is when a comprehension on organizations way to create knowledge is used. As observed by Nonaka, the sharing of knowledge tacitly and explicitly among members of the community cause the members to "embrace a persistent discussion between them which result in the creation of new concepts and ideas" (Nonaka, 1994, p. 15).

With regard to the point stated in the previous paragraph, *explicit* knowledge is transferable and codified knowledge while *tacit* knowledge is "deeply rooted in action, involvement, and commitment in an understandable perception of the human mind and body and is difficult to validate" (Nonaka, 1994, p. 16). Stenmark (2002) contrasted this. He do not distinguish between tacit and explicit knowledge, instead, rather stated that tacit knowledge is the backdrop for the explicit knowledge (Stenmark, 2002, p. 15).

The previous paragraph demonstrates that successful ICT needs to create a space for tacit knowledge. Instead of being a foreign space for documents to live out of context, such knowledge may support knowledge creation. Discussions and conversations between members to assist in the development and generation of shared inventory. These "informal conversations" contain pieces of tacit knowledge and shared attitudes

that form the communal pool of knowledge. Group knowledge exists outside of an individual's control and can only exist in a group which dynamic, attitudes, and cultures will affect common knowledge sharing.

Apart from that, these informal conservations also caused "redundancy of information"; the excess of information of precise information that is needed instantly by a single individual (Nonaka, 1994). This is comparable to hearing the latest news in the hallway or seeing posters up in a physical setting. "The sharing of additional facts between members supports the sharing of member's tacit knowledge. Repeating of information associate's individuals via information unites rather than disseminates" (Nonaka, 1994, p. 14).

In addition, Nonaka and Takeuchi (1995) explained that the creation and sharing of knowledge basis involving the interpretation of tacit and explicit knowledge is achieved in four main principles. Socialization refers to "brain to brain" interactions among individuals such as mentoring, training, conversing and sharing information on workplace culture and experiences. This will result in the creation or advancement of technical skills and mental models. On the other hand, externalization transfers tacit knowledge into explicit knowledge by using metaphors, analogies, concepts, or models (Ahmad, Ahmad, & Rejab, 2011).

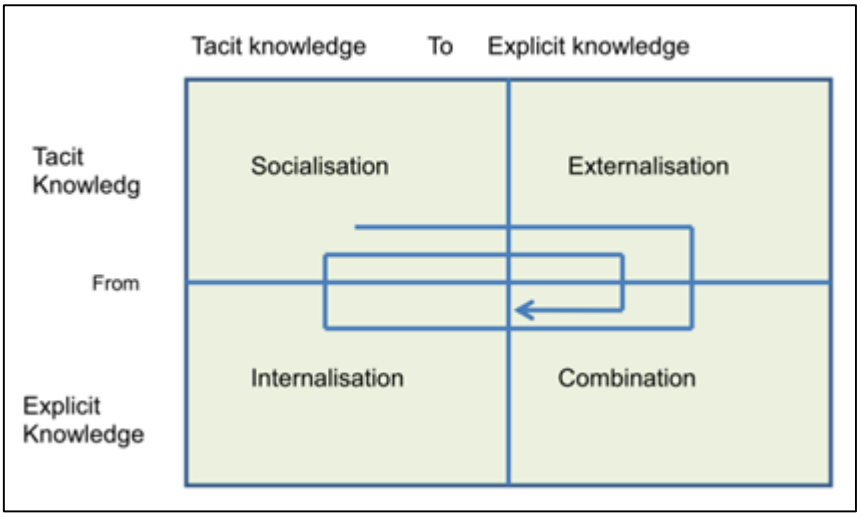


Figure 2.4. SECI Model for Knowledge Creation and Sharing
Source : (Nonaka and Takeuchi, 1995, pp. 71).

2.4.2 Knowledge Sharing in Online Community

Knowledge sharing has received growing exposure within online communities in recent years. Many use the Internet to carry their offline relationships online, but the interaction among web users with no social connections has been trending (Butler et al., 2002). Online communities are computer-mediated platforms for networking and exchange of knowledge (Koh & Kim, 2004). It is worth noting that knowledge sharing is a rich medium where stories are shared and implicit knowledge is transferred through online socialization. The interactions from discussions and collaborations are needed for implicit knowledge sharing. Postings of documents may only transfer explicit and translated knowledge. These literatures demonstrate that the exchange of knowledge is indeed the fundamental angles of any online community.

Knowledge sharing is pertinent in ensuring the survival of online communities. Previous studies demonstrate that despite the significant increase of the online communities members, only little have successfully inspired and encouraged members

to share their knowledge and expertise with others (Lai & Chen, 2014). Online communities are highly dependent on volunteer members (Wang & Lantzy, 2011). Contributors are valuable, and irregular participation may affect resources availability, dominance of voices which will ultimately risk the existence of the community itself (Wang & Lantzy, 2011).

There are many research conducted on the factors that affect knowledge sharing. The factors can be grouped into motivation, attitude, and cultural factors. Ma and Yuen (2010) and Huffaker and Lai (2007) observed that anticipation of online relations and anticipation of perceived connection are significantly influencing knowledge sharing. Meanwhile, Suh and Shin (2010) discovered that online social ties are important in stimulating knowledge sharing behavior. Limpisook (2009) also discovered that In encouraging members to contribute their knowledge, accomplishment plays a leading role among accomplishment motives, allegiance motives and authority motives. These factors will influence members' participating intention, loyalty, and sponsorship in online community.

Apart from that, Li et al. (2007) and Li (2009) stated that cultural factors also affect the activities of sharing knowledge in online communities. This is supported by Pi (2013), who explored sharing culture factors (fairness, identification, and openness). He found that these factors shows correlation with knowledge sharing and an non direct impact via the subjective norm and knowledge sharing.

Previous literature has also identified several other attitude factors such as self-efficacy and performance expectancy. These factors have essential roles in knowledge sharing activity (Tseng & Kuo, 2014). Perceived enjoyment, self-efficacy, individuals' attitudes toward knowledge sharing, and certain personal outcome expectation are also

associated with the extent of sharing knowledge in online blog (Papadopoulos et al., 2013). Furthermore, Cheung, Lee, and Lee (2013) and Hashim and Tan (2015) discovered an inspiration for knowledge sharing in business' online communities is that members feel satisfied when they receive expected reciprocity from other members. Gratification and knowledge self-efficacy also influence their continuous knowledge sharing. Apart from that, Sheng and Hartono (2015) observed that social capital enables knowledge formation and sharing knowledge online. In addition, previous study also demonstrate a significant effect of social value on knowledge sharing in online community (Huang et al., 2014). Chang (2013) identified that intention to share knowledge significantly affects knowledge sharing behaviors. As outlined by Hew and Hara (2006) and Hew and Hara (2007), there are five factors that stimulate knowledge sharing. The factors are: (1) the wish to progress on profession, (2) self-selection type of membership, (3) reciprocity, (4) the role of moderator, and (5) a non-competitive environment.

2.5 Leadership

There have been many studies on leadership in successful and effective societal organization (Bass, 1991). It is an obvious personality trait, but it is complex to be defined (Antonakis, Cianciolo, & Sternberg, 2004). There has been plenty of studies that attempt to define the leadership concept, which has been constantly evolving centuries (Bass, 2008).

Observations of available literature demonstrate that leadership is neither a designation nor a position. It is a mutual procedure where both followers and leaders collaborate to fulfill their organization's goals (Kelloway & Gilbert, 2017). The need for a leader is important especially when there is a dire need for guidance, change or inspiration

(Kelloway & Gilbert, 2017). A leader should be capable of producing more leaders, not more followers (Nader, 1988).

The concept of leadership has a powerful influence on the well-being of an individual and community. As asserted by Bennis (2004), the death of tens of millions of civilians at the hands of evil pseudo-leaders during World War II is a constant reminder of the powerful influence of leaders. Bennis (2004) also claimed that previous theories and literature on leadership should be continuously observed and analyzed to create good leaders. The study of leadership is also important in the business field. Han, Bartol, and Kim (2015) evaluated leadership in an attempt to improve profits and found that good leadership values assist workers to achieve their full potential, hence increasing profits. From his studies on Western Electric, Mayo (2004) found that the good relationship between leaders and followers increases work quality, production, and higher individual growth. In the education sector, leadership practices influence the success of the school's administration, teachers, and students. Meanwhile, Marzano, Waters, & McNulty (2005) found a direct correlation between students' achievement and school's leadership values; students' achievement improved by 10 percentage points on average after educational leadership was improved by one standard deviation.

From these, it can be seen that leaders can ruin or revolutionize a community and improving leadership skills means a universal improvement in individuals' lives (George & McLean, 2007; Maak & Pless, 2009). In an online community, leaders are responsible for the development of community norms and policies (Preece & Shneiderman, 2009) and coordinate interaction between members (O'Mahony & Ferraro, 2007). Drawing from the previous studies discussed, the research seeks to analyze the virtual leadership role in promoting knowledge sharing. It should be noted that this study incorporated Faraj et. al.'s (2015) definition of leadership.

2.5.1 Differentiating Face-to-Face Leadership and Virtual Leadership

Johnson et al. (2015) described leadership is leading in online communities settings. Meanwhile, Hertel, Geister, and Konradt (2005) define virtual leadership as an individual who distributes task and coordinate tasks via computer-mediated communication. These individuals interact with other members via electronic media. Avolio (2016) defines virtual leaders as a person who influences other individuals from different locations to solve issues within the environment. Leadership online play a significant role and are not aligned with the model of Weber (Avolio, 2016). Virtual leaders do not possess physical organization or inherit a position of power (Avolio, 2016). Physical leadership research and Yukl (2006) theory of a single leader who has a unidirectional influence on followers is not suitable to represent a online community leader. What makes someone a virtual leader remains an open research question (Johnson et al., 2015; von Krogh et al., 2012; Yoo & Alavi, 2004). Although these leaders emerge informally, they still influence the attitudes and behaviors of other members in the online spaces they inhabit.

Compared to traditional organizations, members of online communities are shaped by shared practices and interest and are open to all (Ridings, Gefen, & Arinze, 2002). The absence of shared common ground among members in online communities poses more risk than in offline communities. Furthermore, most of the leaders in online communities prefer to remain anonymous and they are unsure that others will perform as anticipated (Ridings et al., 2002). The absence of a physical relationship between leaders and members in online communities makes it harder to share knowledge. Virtual leaders have a strong influence on online community members'. Online communities appear to be an anarchic collection of members, and these groups of

individuals lack formal authority. Nonetheless, members of the communities have strong relationships, strong group norms, actively producing information, and fulfill other followers' needs. These values seem to be unattainable without some form of leadership by inspiring members (Johnson, 2008). Apart from that, there seem to be some contradictions at the core of online communities. Leadership studies demonstrated that online communities and traditional organization share similar fundamentals. Nevertheless, online communities emphasize behaviors such as monitoring, influence processes, rewards and punishments, knowledge sharing attitudes, task delegation, and the outcomes relevant to online communities (Johnson, 2008).

In addition, given the lack of real-life connection in online settings, there is no designated position. Network position is primarily based on how new ties are formed, where online contributions are made, and how those ties influence others' impressions (Dahlander & Frederiksen, 2012; Wellman & Gulia, 2018). Previous empirical researches demonstrate that leaders in online community are more inclined to get involve in community for a long span of time, post frequently and establish more ties with other members. Nonetheless, in online communities that are based on knowledge sharing, virtual leaders are not necessarily more "chatty" than others. (O'Mahony & Ferraro, 2007).

2.5.2 Virtual Leadership in an Online Community

The study of online community leadership is a potential domain for researches despite its infancy (Faraj et al., 2015). According to Yukl (2006), "leadership is the practice of assisting individual and cooperative efforts to achieve shared objectives" (p.8). Online community leaders are recognized by their knowledge and by their impact on the

community members' communication. Apart from that, Butler et al. (2002) describe a virtual leader is a role officialised through the structure of the community. The role of this position is to sustain the community, encourage participation, control the environment and promote the online community. Yukl (2006) states that a virtual leader is a member that is perceived by other community members as someone who is influential. Virtual leaders are responsible for community building, encouraging other members' participation and also contributing content in online communities.

Moving on, influence is " a switch in individual awareness viewpoint or reactions, which has its origin in another individual or community " (Raven & Fishbein, 1965, p. 371). "When a person accommodates behavior, attitudes or belief of other individuals in the social system, influence has happened" (Leenders, 2002, p. 26). It is much easier to influence others nowadays compared to before. Influence is important to the development of followership. There are various ways used by leaders to influence their followers (Gorry & Westbrook, 2009).

Leaders' influence can be formed by developing a relationship with followers, sharing power, giving up control, and engaging people in trustful relationships (Omilion-Hodges & Baker, 2017). Some instances in open source software communities demonstrate that leaders are essential in motivating members to produce successful projects. Nonetheless, the leadership practice in OSS communities can differ dramatically from traditional organizations. One of the key distinctions is how the leaders exercise their authority to help a group achieve its goals, while simultaneously avoiding alienating a community of intrinsically motivated volunteers who are prone to quit and bring the projects with them (Reagle Jr, 2007). "Managerial commands"

(Benkler, 2006) may not be well-received, but suggestions, guidance, and creative vision are necessary for successful completion of complex projects and their sustenance.

2.5.3 Virtual Leadership and Knowledge sharing

Leadership is among the four major features of sharing knowledge (Cegarra-Navarro & Cepeda-Carrión, 2010; Farid, Davaji, & Barani, 2016). Virtual leaders are important in building a conducive environment and encouraging followers intrinsic motivation to share their knowledge with others (Gamo-Sanchez & Cegarra-Navarro, 2015; Wang & Hou, 2015). Apart from that, Fullwood, Rowley, and Delbridge (2013) demonstrated that knowledge sharing significantly impact the competitiveness of a community or organization. It is assumed that communities that have good leadership practice will be producing, sharing, and reusing knowledge effectively (Nguyen & Mohamed, 2011). Furthermore, knowledge sharing consists of tacit and explicit knowledge that is pertinent to any tasks at hand (Lee, Gillespie, Mann, & Wearing, 2010). This is because community culture encourages knowledge sharing among members. It is also believed that the right leadership values can inspire and encourage knowledge sharing (Bryant, 2003; Eisenbeiß & Boerner, 2010) by stimulating discussion and cultivate a collaborative atmosphere (Bass & Riggio, 2006; Northouse, 2016).

Moving on, understanding the motivations that increase leaders' engagement with other members is important to encourage content contributions via communication and connection online. Butler et al. (2002) suggest that leaders are inspired by the virtuous advantages that are rooted from assisting others by sharing their knowledge. Meanwhile, Connelly and Kevin Kelloway (2003) stated members opinions of their supervisors' encouragement and support are crucial in promoting positive knowledge sharing culture. In their study of a global organization, Cabrera, Collins, and Salgado

(2006) emphasized that the perceptions of support from supervisors influence their contribution toward sharing their knowledge . This is because of the normative environment that put a sense of pressure on an individual.

2.5.4 Leadership Behavior

Leadership behaviors are the ways that the leaders guide their members (Certo & Certo, 2006). These behaviors are developed through experience, practice, education, and training. There has been a long history of studies on the relationship among leadership behavior, productivity, and effectiveness (Dessler & Starke, 2004). Some of the leadership behaviors are transformational leadership, transactional leadership, shared leadership, aversive leadership, supportive leadership, initiating leadership, and others. These behaviors have been proven to be effective in guiding followers during different time and situations (Leithwood, Jantzi, & Steinbach, 1999). Leadership behavior also observed to have an important effect on member's behavior and traditional organizational outcome (Tickle, Brownlee, & Nailon, 2005).

This study recognized four important leadership behaviors that are adopted from the Path-Goal theory. These behaviors are important in determining the leadership behavior demonstrated by a leader in online community settings. The behaviors concerned in this study are supportive leadership behavior, participative leadership behavior, achievement-oriented leadership behavior, and directive leadership behavior.

2.5.5 Followers' Attributes towards Knowledge Sharing

The dispositional measurement of an individual's attributes measured by the researchers will predict the former's knowledge sharing behavior (Barbuto & Scroll, 1999; Grams & Rogers, 1990; Kegan, 1982; McClelland, 1985). There have been many kinds of literature in the behavioral domain that examine a person's motivation by

evaluating their personality, life experiences, motivation, attitudes regarding online community, peers, and temperament (Barbuto & Scroll, 1999; Grams & Rogers, 1990; Kegan, 1982; McClelland, 1985).

Moving on, understanding individuals' attributed are pertinent in assessing what does inspire knowledge sharing among members of an online community. Such approach may also assist leaders in adapting the right leadership behavior to suit the needs of their followers and cultivate the latter's passion to share their knowledge. Faraj et al. (2015) observed that the key questions on the ways of leadership behavior in engaging knowledge sharing among members remain unsettled. In the online context, specific individual attributes need to be understood to shape followers' perception of knowledge sharing in virtual environment.

A clear understanding of the individual attributes of followers helps leaders to shape followers perception on contributing their knowledge in online environment (Faraj et al., 2015). There has been a lack of research in this area. Most studies focused on the attributes of followers in offline contexts, focusing on organizations, firms, and educational settings (Avolio, 1994; Bass, 1995; Beck, 2014; Bommer, Rubin, & Baldwin, 2004; Fausing, Joensson, Lewandowski, & Bligh, 2015; Hoch, Pearce, & Welzel, 2010). Most studies also focus on the individual characteristics of team performance and leadership development (Carson, Tesluk, & Marrone, 2007; Garavan, Watson, Carbery, & O'Brien, 2015; Hoch et al., 2010; Small & Rentsch, 2011). In short, studies in a similar vein but within online contexts are scarce. Thus, this study are trying to contribute by evaluating individual attributes of online communities followers that assist in promoting knowledge sharing behavior using a relevant theories to guide the study to fill the gap.

2.5.6 Leadership Theories

Although leadership emerged in the 1700s, empirical research in this area only started in the 20th century (Bass, 1985). Throughout the 20th century, there were several leadership theories developed following intensive study from various angles of leadership concept that constructed from different perspectives. According to Bennis and Nanus (1985), social psychology is the most vague areas. The theory of leadership remains at the top, as there is limited knowledge on this theory compared to other areas in behavioural science.

Theories are applied in academic research as the unified view of the ideas or variables related to issues under investigation (Nawaz & Khan, 2016). Leadership theorists was concern to study and to explain how a leader has influence over a community, to preserves and retain them (Nawaz & Khan, 2016). But among scholars there is still no general agreement on how a leader earns this influence and exerts it. According to Latham (2014), researchers' numerous attempts to explain the leader's impact have resulted in numbers of leadership theories being developed. There are certain constraints for each theory of leadership as well as no theory in isolation explains leadership thoroughly (Latham, 2014). It is therefore not surprising that the current leadership literature is being requested more and more with a view on developing more rigorous leadership explanation. (Anderson & Sun, 2015; Latham, 2014). Among the most prominent theories widely used by researchers in leadership studies are the Trait theories, Transformational Leadership theory, Servant Leadership theory, Authentic Leadership theory, Leader Member Exchange theory, Fiedler Contingency theory and Path-Goal theory (Derue, Nahrgang, Wellman, & Humphrey, 2011).

Over the years, theories of leadership have undergone significant changes. According to Glasman and Glasman (1997), the earliest theoretical framework is the Great Man

theory, which suggests that leaders are born and not made; leadership comes mostly from instinct rather than training. The following theory that evolved from Great Man theory is Trait theory, which suggests that leaders possess certain physical characteristics, personality traits and intellectual abilities (Ghiselli, 1971). Trait theory focused on leader-centric approaches (Dinh et al., 2014). The basis of these approaches is the idea that there are genetic and heritable traits that distinguish leaders from non-leaders and give them a better propensity to lead (Walter & Scheibe, 2013). The great man theory and trait theory tend to favour authoritarian leadership styles. There was wide application of the great man theory and the trait theory to leadership in business and politics in the early 20th century. By the middle of the century, however, both theories were in decline (Nawaz & Khan, 2016).

The reasons why this study is not adopting great man theory nor trait theories is because of the absence of a coherent connection between leader-follower interactions. Meuser et al. (2016) found that trait theorists have not been able to articulate a connection between social identity and implicit leadership, which is essential to the emergence of influence on followers. This finding confirms the work of Uhl-Bien, Riggio, Lowe, and Carsten (2014), who found that a great number of authors approach leadership studies from the perspective of the leader and give little consideration to followers. Another component that is lacking is leadership behaviours, environmental characteristics and task characteristics which is an essential component toward guiding followers to succeed in achieving specific goals or succeed in adopting certain behaviours in any environment (Northouse, 2016).

Next comes the Transformational leadership theory. Those who subscribe to the behaviorist theory, suggest that the focus of leadership research should not be the traits of effective leaders, but their behaviors in various situations. Burns (1978) laid the

foundation of the transformational leadership theory, and showed that an effective leader is able to focus on the collective values and needs of the group instead of individual concern. This theories also emphasize on raising the aspirations and higher order values of the followers to feel better about their work and work to exceed base expectations (Van Dierendonck, Stam, Boersma, De Windt, & Alkema, 2014).

Although transformational leadership theory stated by previous studies to be best for motivating followers, there are a growing body of literature disagrees with this finding. Alvesson and Kärreman (2016) claimed that transformational leadership lacking in moral safeguard, stating that the increased motivation inspired by the transformational leader lead to hero - worshipping and violate any moral concerns that followers may have. Alvesson and Kärreman (2016) also stated that transformational leadership theory is a leader-centric which assigns overwhelming credit to the leader for individual, group, or organizational development. McCleskey (2014) noted transformational leadership theorists tend to view organizational development as the result of the influence of the leader while disregarding any possible contributions from other factors such as followers' contributions and other situational or process as well as task factors of the followers. This theory also focusing on one leadership behaviour, whereas this study wants to investigate multiple types of leadership behaviour to understand each leadership behavior impact on followers behaviour. This theory mismatch the aim of this study which investigating leadership not from the perspective of the leaders, but on the perspective of followers and in terms of the role that followers play in the leadership process as well as examining different leadership behaviour on what suited best on the followers task and environment to increase knowledge sharing of members.

Furthermore, comparing other theory with Path-goal theory. The leader in PGT is focusing on followers characteristics on helping individuals accomplish their task in a

fashion that is satisfactory to them and the leader (Robert, 2017). PGT also suggests that leaders choose a leadership behavior that correlates to work being done and best fits their needs of the individual. As an effective leader, they attend to the needs of followers, set goals, determine path (outcome), and help provide support when obstacles arise in reaching goal accomplishment (House & Mitchell, 1974).

Servant leader theory is arguably an extension of the great man and trait theories as well as transformational leadership. The move towards servant leader theory began as leadership theorists started to increase their focus on a shared and relational perspective with emphasis on the interaction between leaders and followers (Parris & Peachey, 2013). Greenleaf (1977), posited that individuals become leaders by virtue of not only their personal characteristics but also their motivation to serve. Proponents of servant leader theory see the leader as a motivator who acts in ways that encourage the followers to strive for the desired individual and organizational outcomes (Panaccio, Henderson, Liden, Wayne, & Cao, 2015). Flynn, Smither, and Walker (2016) posited the core premise of the servant leader theory is that leaders subjugate their interest to the interests of the followers in a bid to increase individual and group performance. This combination of the leader's need to serve with the motivation to lead is akin to introducing an element of social responsibility into transformational leadership.

Lynch and Friedman (2013) stated a servant leader might become too focused on the needs of the followers and ignore the needs of the organization or the world beyond that seems with an inordinate to please others. Lynch and Friedman (2013) stated former Goldman Sachs CEO Lloyd Blankfein might be seen as a servant leader because his company was making plenty of profit and bonuses for the staff, but the product was not necessarily good for the organization and the world beyond Goldman Sachs. Compared to Path goal theory which combines task characteristics that will direct

leaders and followers efforts towards goal attainment. Provides a great model for helping individuals clarify goals, set goals through coaching and direction to achieve goals of productivity. Also, four leadership behaviours of PGT can determine which leadership behaviour suited the followers task and environment characteristics to achieve the goal of the community.

Authentic leadership theory is a concept of leadership based on the high ethical and moral compass of leaders, and the assumption the leaders will act not in their own selfish interest but will act in the best interest of the followers and the group (Azanza, Moriano, Molero, & Levy Mangin, 2015). The essential elements of authentic leadership such as selflessness and vision are also inherent in the definition of transformational and servant leadership theories. Authentic leadership is closely related to transformational leadership. Authentic leadership incorporates transformational leadership or at a minimum, adds ethical leadership qualities to established transformational leadership behavior. In a study designed to investigate the relationship between transformational leadership and authentic leadership, Joo and Nimon (2014) found that the two leadership styles are not only closely related and have overlapping areas, but are complementary of each other.

The Leader-Member Exchange (LMX) theory focus on reciprocal influence processes, composed of one person who has direct authority over another person (Yukl, O'Donnell, & Taber, 2009). The basic principle of the theory is that a leader develops a separate exchange relationship with each follower as the two people mutually define the role of the follower (Yukl et al., 2009). This theory has little concern for situational variables (Yukl et al., 2009). The approach of the theory places followers into two categories of relationships with the leader called *out-group members* and *in-group members* (Sherony & Green, 2002). The *out-group* members have a low relationship with the

leader (Sherony & Green, 2002). While, the *in-group* members in this high-exchange relationship have a closer bond with the leader that results in benefits to the leader and follower (Sherony & Green, 2002).

The LMX Theory mismatch this study, which this study believes that by classifying members based on in-groups and out-groups may create inequities between groups (Scandura, 1999), whereas this study is focusing on motivating all online communities voluntary members to increase their contribution. Previous studies also stated that the model lacks an understanding of the dyadic process (leader-member exchange) associated with LMX theory (Schriesheim et al., 2001), a better understanding on whether LMX is one-dimensional or multi-dimensional (Graen & Uhl-Bien, 1995), and the measurement scales have been developed on an ad-hoc without any presentation of clear logic or theory to justify changes in scale validity (Schriesheim et al., 1999).

Fiedler provided a Contingency theory that linked a leaders' style with a group's performance (Miner, 2015). This theory was one of the first models that suggested a relationship existed between leaders, followers, and situations. According to Fred Fiedler (1967), his hypothesis that leaders practice either a *task-oriented* style of leadership or a *relationship-style* of leadership is supported by his model's findings (Miner, 2015). Leaders that focus more on the task and the process to achieve a specific task would fall into the *task-oriented* leadership style (Miner, 2015). Those leaders that have good interpersonal skills and favour the connection with people over the task would be *relationship-style* type leaders (Miner, 2015). Fiedler's theory continued that no one leader could possess both types of leadership styles. Therefore, the most essential leadership issue is to match the leadership style to the situation (McCleskey, 2014).

According to this theory, the leader's personality and traits would force the individual into one of the categories. However, this forced fit into one of the styles of leadership was a result of a trait measurement called the *least preferred coworker (LPC) score* (McCleskey, 2014). This measurement technique scores leaders on their feelings and attitudes towards followers who have worked for them in the past. Scoring a low *LPC* would reflect a leader who is more suited to being a *task-oriented* leader (Miner, 2015). Scoring a high *LPC* would reflect a leader who values the relationships with people more than the tasks (Miner, 2015). This type of leader, with a high *LPC*, would be classified as a *relationship-style* leader (Miner, 2015).

Fiedler Contingency theory suggests that leaders are only effective when they are matched with the right followers and situation. Having leaders with a specific leadership style for certain appropriate task can only be sustainable if the situation never changed. However, people and situations can change swiftly and often. When the situation changes or deteriorates, these leaders' abilities and skills would immediately become ineffective, which can hinder followers productivity and satisfaction. This one of the criteria indicating that is not suitable to adopt this theory to conduct this study in a fluid environment of online communities, where people can always join and leave within a seconds without any bond or contract that tight them. On the other hand, the path-goal theory emphasises that leaders can adapt one or more types of leadership at any point in time depending on the subordinates and the situations' requirements (Northouse, 2016). This versatile approach to leadership can increase leaders' effectiveness in most situations. The drawback of contingency theory also that it fails to provide solutions for how to improve or modify leaders' behaviors in evolving conditions. A better solution for this study is path-goal theory by developing other

leadership behaviors to match the followers. Therefore, this study recommends the path-goal theory.

2.6 Path-Goal theory

Apart from the leadership theories that have been discussed, this study adopt the Path-Goal theory. Path-goal theory is intended to help leaders build the way for each followers to attain particular goals in any environment. The role of leaders helps their followers prevent obstacles in achieving their objective by emotionally supporting and supplementing or substituting what is missing in the environment they are (Northouse, 2016). When the followers reach their aims, each of them will receives an appreciation and rewards they value that increases their satisfaction. This theory emphasize that a successful leader should "[select] specific behaviors that are best suited to followers' needs and to the situation in which followers are working" (Northouse, 2016, p.116).

According to this theory, the four leadership behaviors that minimize role ambiguity and are advantageous for the followers are directive, supportive, participative, and achievement-oriented behaviors (Northouse, 2016). The contexts of environments, situations, and tasks affect the chosen leadership behavior for effectiveness sake. House and Mitchell (1975) stated that the four leadership behavior can be implemented by considering different type of followers in different situations. Path-Goal theory does not focus on only on type of leadership like trait approach. This theory emphasize that leader should adjust their behaviors according to the followers motivational needs, such as if followers requires the role of participative leadership at one level in ensuring their objectives achieved and directive leadership at another point of task, the leader should cater to this. There may also be a situation where it is more suitable to use at one time more than one leadership behavior.

Furthermore, House reviewed this theory initially on 1971 till 1996. Regardless of the level of the model, the fundamental of this theory concentrated on the daily communication between the leader and the follower. The theory also focus on the leader role as a guidance in helping followers in finding suitable way to achieve the goals of organizations more effectively and efficiently (Northouse, 2016). It is important to note that various leadership behavior will differently effect followers motivation. The influence of leadership behaviour depending on the characteristics of followers and task (Northouse, 2016). In 1971, the theory only underpinned with supportive and directive leadership behavior. Meanwhile, in 1974, two leadership behaviour which are achievement oriented and participative leadership were added. In 1996, Path-Goal theory have been expanded by reformulating the leaders' influence on the workgroup. Moreover, factors of situational included with environment and follower retained (Northouse, 2016). The 1996's reformulation laid the ideas that might occur on some situations that leaders will have a little on no impact (Hirt, 2016). As noted by Bass, the leader "needs to complement only what is missing in a situation to enhance the follower's motivation, satisfaction, and performance," (1990, p. 627).

Apart from that, Path-Goal theory has a theoretical complex approach and logical path. In theory, it delivers an established prediction on the interaction among leadership behaviors, attributes of followers and task characteristics in motivating followers. This assists leaders by establishing practical directions to help followers achieve their best work. The basic model of the theory is shown in Figure 2.5.

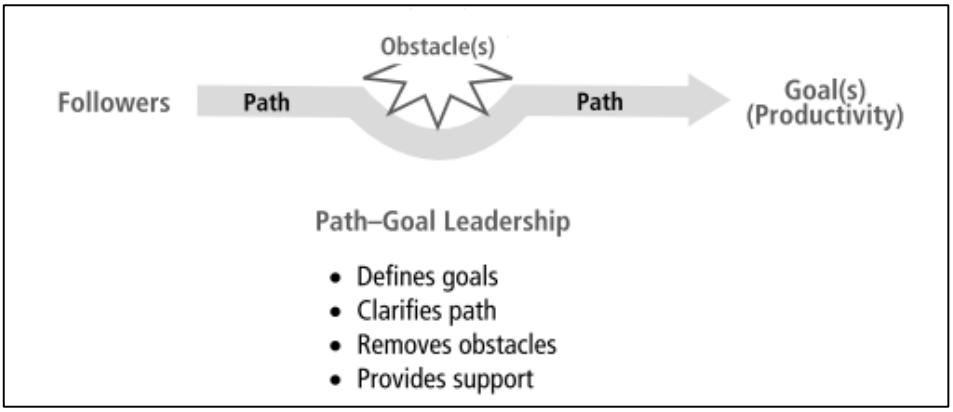


Figure 2.5. The Basic Idea Behind Path-Goal theory

Source: (Northouse, 2016)

Path-Goal theory underpinned by expectancy theory of motivation which is theorized by this this motivational theory (Vroom & Jago, 2007). The whole idea of this theory is that the followers will feel motivated if the perceive their efforts and self ability that they will come out with expected outcome as well as believing that the effort that they are going to put in certain behavior are worth it. This is in line with Social Cognitive Theory (SCT), where capability is also known as self-efficacy, while the possible outcome is characterized as outcome expectancy.

The concept of the Path-Goal theory is complex. Figure 2.6 shows the various element of Path-Goal theory, including leader behaviors, follower characteristics, and task characteristics. This theory proposes that in order to know if certain behavior is able to motivate the followers is depend on the followers and task characteristics. The first criterion of the Path-Goal theory is the leadership behavior. House and Mitchell (1974) defined four types of leadership behaviors: Directive, Supportive, Participative, and Achievement-Oriented. The four behaviors under the Path-Goal theory are described in detail in the next subsection.

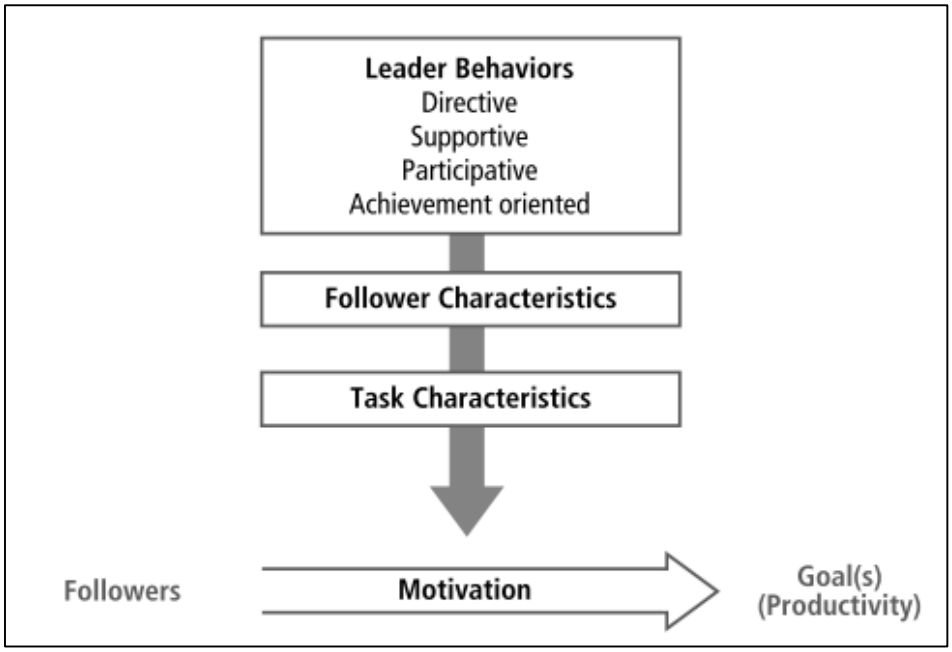


Figure 2.6. Summary of the Major Components of Path-Goal theory
Source: (Northouse, 2016).

2.6.1 Directive Leadership

The first Path-Goal theory of leadership behavior is Directive leadership. This theory is in line with the "initiating structure" concept of the Ohio State studies (Northouse, 2016). In addition, this theory characterizes a leader as someone who define and enforce rules and regulations on followers to avoid conflict and set backs from happening. This leadership behavior also instruct followers about their task, including their expectations, method to be used and deadline of the task as well sets clear standards of performance (Northouse, 2016). This behavior is effective to avoid uncertainty within the environment (Gawaza, 2016).

Apart from that, Directive leadership is also comprised of task coordinating behavior. Task coordination is the act of managing interdependent work among team members (Wang & Lantzy, 2011). This is important in assisting members in their tasks to ensure

effectiveness and the achievement of key milestones. A leader that possess this leadership behavior will know exactly what must be done and the way it must be performed. This leadership behavior is more suited to be applied to inexperienced followers who require guidance and regular supervisions.

With regard to online communities, this leadership behavior contributes to the successfulness of Wikipedia and Open source software community. This is done through coordination of task in broad and detailed way (Zhu et al., 2013). Furthermore, scholars have constantly found that Wikipedia's achievement relies on the process of producing and arranging works. This results in articles to slowly and regularly grow, quality maintenance and increase worldwide coverage (Zhu et al., 2013). This demonstrates that effective coordination of task will increase the probability of achieving the objectives in an online community. In other words, the leader with this behavior may increase members' ability, empower them and consequently, increase knowledge sharing and attainment of knowledge (Kirkpatrick & Locke, 1996; Yukl, 1999).

Apart from that, Directive leadership also consist of regulative behavior. According to Northouse (2016), a directive leader establishes clear performance quality and rules and regulations to avoid conflict. In online settings, directing a regulative behavior will maintain a healthy online environment by eliminating taxing and threatening circumstances from adversity and setbacks (Bruckman et al., 2018). Failure to regulate individual misbehaving in online communities such as the exchange of unethical and unrelated content will affect the goal and quality of the established communities. Apart from that, participants' turnover will also increase. This is highly concerning especially for those who are experts and knowledgeable volunteers within the community. The inexistence of experts will reduce the established community to a ghost town.

Therefore, sets of rules or "implicit contract" formed by a leader will ensure a good healthy environment and supervised communications.

2.6.2 Supportive Leadership

House (1971) formulated a Path-Goal theory that stated that a leader should helping achieving the followers goals, specify path to go as a direction, provide support and make sure the followers take is aligned with the goal and vision of an organization. Supportive leadership concentrating on fulfilling followers needs and satisfaction; there is a deep understanding about followers wellbeing, choices and fulfilment (House, 1971). There are two dimensions to supportive leadership which are influential (changing one's life to a better life) and emotive (easy to communicate with) elements (La Rocco & Jones, 1978). Leaders who knows their job and responsibility to support and guide employees and making their task easier are reflected as being a supportive leaders. Apart from that, supportive leaders can produce an encouraging and conducive workplace by fostering respect, trust, cooperation, and emotional support (Chih, Kiazad, Cheng, Emamirad, & Restubog, 2018; Huey Yiing & Zaman Bin Ahmad, 2009). It is worth noting that a workplace with supportive leaders produces high-quality results.

In addition, leaders with this behavior pay a numerous attention to meet the needs and satisfaction of the followers. They are friendly, empathetic, treat followers with respect and provide them with necessary support. Such values are useful when employees are having problems, lacking in self-confidence or feeling demotivated with the current situation. Northouse (2016) characterized a supportive leader as being friendly, approachable and attends to the needs and cares about his/her followers. Leaders with supportive behaviors try as hard as they could to create a pleasant work environment

for their followers. They also see their followers equally show mutual respect, in addition to showing genuine concern toward their followers needs.

Moreover, supportive leadership behavior is in line with social relationship behavior and motivational behavior. Social relationship behavior is defined as a connection between two or more individuals where each person has influences on one another (Harvey & Pauwels, 2009). Meanwhile, supportive leadership approach strengthens the relationship between perceived leaders and followers. In voluntary platforms such as online programming communities, it will be hard to inspire other participants to engage in knowledge and experience sharing without a strong sense of camaraderie. Leaders with social relationship behavior can fix this. Through such behavior, members can relate with leaders' vision and will have certain expectations of the online community. Examples of outcomes expected are an increase of knowledge, sharpening their skills and making more friends with similar interests or skill sets. Wasko and Faraj (2000) observed that the stronger the bond a member have towards an online community, the higher the participation.

Furthermore, Wenger (1998) stated that the fundamentals of a leadership are embedded in a social relationship. In a traditional organization, the behavior of an employee reflects the behavior of the leader. This is part of human nature; we tend to act as we are treated. Employees will tend to reciprocate the values that are shown by their leaders, for example, guidance with service orientation, demonstrate empathy and care, transcend their self-interest, and act in the best interest of their employees (Van Dierendonck, 2011). These employees will be more cooperative with their leaders and have a higher commitment towards other members, stakeholders, leaders and the

organization as a whole. An example of cooperation would be engaging in knowledge sharing that will support and sustain the community.

Apart from that, it is important that members of online communities have a sense of relationship based on similar interests with other members of the community. These are the bond that ties online community members as one social entity (Wenger, 1999). Creed (2009) founds that the lack of offline communication cues does not hinder interaction between members in online communities. Instead, they use other styles of interaction to spread their knowledge and maintaining their relationship with other members. In online communities, the higher the connection and social relationship of a leader with members, the higher the participation and contribution from online community members (Lampe, Obar, Ozkaya, Zube, & Velasquez, 2012).

Supportive leadership is also related to motivating behavior. Motivation behavior is a theoretical concept that is referring to the reasons underlying an individual's behavior (Guay et al., 2010). This behavior is used to encourage the spirit of coordination among members (Cacioppe, 2000) as it is difficult to increase participation among members without strong motivation on their part (Ipe, 2003). Through motivational mechanism, leaders stimulate followers by providing a convincing goal and a suitable model to achieve the said vision. A good leader with this behavior can make their members believe that they are capable. Consequently, they will feel empowered to realize the community's goal by sharing their expertise, experience and their knowledge with other members of the community (Kirkpatrick & Locke, 1996; Yukl, 1999).

It is worth noting that seasoned followers with consistent motivation will likely to actively involve in discussions and sharing their knowledge (Ardichvili et al., 2006). From this, it can be seen that supportive leadership behavior is important to influence

members' content contribution (Wasko & Faraj, 2005). Kankanhalli, Tan, and Wei (2005) observed that leaders with a high level of motivation enjoy helping others. As mentioned before, employees will reciprocate the values shown to them; supportive leaders who enjoy helping other will motivate other members to share their knowledge. Consequently, members will produce better innovations, better quality work and increase their efficiency.

2.6.3 Participative Leadership

Participative leadership includes engaging followers to be involved in makings decision. A participative leader refers and discuss with followers, collects followers perspectives and involve their views and suggestion into decision making in the organization's direction (Northouse, 2016). It involves all team members in identifying important goals, strategies development, and the procedures to achieve the goals (Gawaza, 2016).

In a conventional organization, participative leaders invite followers input on all organizational decisions. Followers are provided with relevant information on organizational concerns and majority of people vote to decide the future of action that the organization will act on. The advantage of this approach is that it will ensure staff readiness in accepting a change of policies, as the decisions are based on general consensus (Koopman & Wierdsma, 1998). This will avoid any resistance and ease the process of the implementation of new ideas. Followers are given an authority to help determine the success of an organization, and this assist in adjusting the policy changes.

In online programming communities that are mostly comprised of volunteers, participative leadership behavior can include members of online communities in online

communities decision making. These members will be able to decide their own creative and innovative way of contributing to the online programming communities that they are involved with. According to Sashkin (1976), boosting up the level of followers' involvement in decision making will higher up performance among them. Participative leadership foster a followers with having a sense of ''psychological ownership'' among members (Sashkin, 1976), increase followers confidence of their self-efficacy and authority, and decrease their feelings of powerlessness and hopefulness (Arnold, Arad, Rhoades, & Drasgow, 2000b).

Furthermore, previous studies suggests that the participative behavior of a leader plays a vital role in facilitating followers with intrinsic inspiration, feeling valuable and worthwhile, and a sense of self-determination (Deci, Connell, & Ryan, 1989). Several authors also indicate that participative leadership behavior is expectedly to empower the employees (Ahearne, Mathieu, & Rapp, 2005; Leach, Wall, & Jackson, 2003). Note that having a psychological authorisation stated by previous studies as one type of intrinsic motivation to work on the given task. This motivation is manifested in four cognitive dimensions: meaning, impact, competence, and self-determination (Conger & Kanungo, 1988; Spreitzer, 1995; Thomas & Velthouse, 1990). Therefore, providing members the opportunity to choose their own project and cultivating trust among followers will increase their motivation and performance (Huang, Davison, Liu, & Gu, 2009).

Northouse (2016) observed that there have been many types of research being done on directive leadership and supportive leadership. In contrast, there is a lack of studies being done on participative leadership and achievement-oriented leadership. Nonetheless, the results of this study demonstrate that participative leadership and

achievement-oriented leadership are vital in motivating online community members in knowledge sharing.

2.6.4 Achievement-Oriented Leadership

A leader with achievement-oriented leadership challenges followers to perform at their best. This type of leader set a high bar toward achieving excellence and try to improve continuously. In addition, achievement-oriented leaders demonstrate high confidence that their followers are having the ability and able to achieve a challenging goals set by them (Northouse, 2016).

Furthermore, achievement-oriented cultures may help the followers understand the flow of knowledge within the community and the assignment of specific roles. According to Ardichvili et al. (2006), achievement-oriented cultures in an offline organization such as those in the United States, status is a result of past achievements or how others relate to his or her position in the community. In other words, a functioning member of a society gains their status through a history of achievements and contributions (Hildreth, Kimble, & Wright, 2000).

In online communities, achievement-oriented leadership may boost the followers' motivation to attain specific goals that may lead to external and internal reward. Examples of external reward are a higher ranking, a better skill sets for career improvement, a new network of good teams to collaborate with, and higher status in online programming communities (beginner, intermediate, advanced, top contributor and expert). These rewards exist in many online communities such as Linux and gaming communities (Ducheneaut, Yee, Nickell, & Moore, 2007). Meanwhile, internal achievement can be perceived by followers through successfully accomplishing a challenging task, increase in knowledge, wider network and successfully guiding others

to accomplish tasks. It can be seen that achievement-oriented leadership with possible internal and external reward will motivate them to contribute, to reach a goal and to expand the empire of the online community.

There are two other major components of Path-Goal theory in addition to the four discussed leadership behavior illustrated in Figure 2.6. These are the followers' characteristics and tasks characteristics. Both of these elements impact how the behaviors of leaders affect the motivation of followers. The impact of leadership depends in other words on the characteristics and tasks of both followers.

2.7 Followers Characteristics and Social Cognitive Theory

Followers' characteristics determine followers' interpretation of a leader's behavior in the current context of work. Most authors focused on the self-perceived level of task ability of followers, and perceived level of outcome (Northouse, 2016). These characteristics are few of many others that determine the extent of whether the followers discover a leader's behavior an urgent basis of motivation and fulfilment.

Moving on, Path-Goal theory anticipate that individuals self-assessment of their own ability will affect the influence of motivational leadership. The increase of followers' confidence in their own ability calls for a decrease in directive leadership. In such cases, directive leadership becomes redundant and perhaps becomes excessively controlling. Path-Goal theory suggests that followers who are dogmatic, authoritarian and have to work in uncertain situations should be provided with directive leadership. This is because directive leadership provides clarity of psychological structure and task. Directive leadership also helps clarifying followers path toward achieving goal, making it less ambiguous (Northouse, 2016).

In this study, 'the ability of followers' factor in Path-Goal theory is adopted from Social Cognitive theory. This factor is taken into consideration to measure the capability of online programming community members to share their knowledge. Bandura (1997a) explains that Social Cognitive theory is comprised of two elements. The first element is the observer's self-efficacy – the beliefs of one's ability to effectively perform such behavior. With regard to this study, the increase of self-efficacy will increase individuals' self-confidence in sharing their knowledge. They will then consider the likelihood of participating in knowledge-sharing with other community members. The second element is outcome expectancy. This element is based on imitation perspective; the observer expects to have the similar outcome by observing other members performing the similar behavior. When other members are being promoted or rewarded due to certain actions other members will be expecting the same desirable outcome. In contrast, if members observe the occurrence of undesirables' behavior such as rejection, reprimands and unrecognizing members' contribution, this will inculcate undesirable outcomes expectancy. Eventually, leading to higher chance of being passive and leaving the community. Therefore, the expectancy is the perceived probability of an outcome, and the perceived desirability of a result is valence. If followers think that the results (high valence) are attractive and the effort will achieve a result (high expectation), then they will make the effort. Leadership behavior primarily utilizes these perceptions and beliefs. The discussion of self-efficacy and outcome expectancy used as a predictor of knowledge sharing behavior of the online community members are discussed in detail in Social Cognitive theory section.

Followers' characteristics are important in determining the type of leadership behavior needed to motivate contribution and avoid turnover in online community. Perceived leaders in online community who are aware of followers' characteristics and ability will

understand the actual needs of the followers. In turn, this will generate a form of understanding among the members on the cause of the community. Understanding people characteristics and their reasons for participating in particular activities will help in structuring the best type of leadership behavior to suit a situation. Note that followers' characteristics are one of the main components in Path-Goal theory. Hence, Social Cognitive theory is adopted as it discusses the concept of perceived level of task ability and perceived level of outcome. Both of these characteristics are equivalent to self-efficacy and outcome expectancy which are grounded in Social Cognitive theory. The next section discusses the Social Cognitive theory (SCT) in detail.

2.8 Social Cognitive theory

Social Cognitive Theory is adapted from Bandura (1986). Bandura (1997a) defines that human behavior is a triadic, dynamic, and reciprocal interaction of personal cognitive factors, behavior, and the environment. These parts influence one another constantly. Each of these factors is also uniquely determined by individuals' behavior (Bandura, 1997a; Deluga, 1998).

SCT was widely used in the literature of information systems (IS) and they demonstrated acceptable levels of validity. Among the element that have an impact on the functionality of human, self-efficacy and outcome expectancy stand at the core. (Chiu et al., 2006). Self-efficacy is "a judgment of one's ability to organize and execute given types of performances," while an outcome expectancy is "a judgment of the likely consequence such performances will produce" (Bandura, 2007, p. 21). Some recent studies have examined the relationship between personal cognitive factors based on the Social Cognitive Theory (self-efficacy and/or outcome expectancy) with computer use and behavior of the Internet (Compeau & Higgins, 1995; Hsu & Chiu, 2004; Hsu, Ju,

Yen, & Chang, 2007; Luarn & Lin, 2005). In addition, Social Cognitive theory have been integrated in several domains such as in predicting behavior toward health (Ellis, Brown, Ramsay, & Falk, 2016; Uszynski et al., 2016) sport behavior (Hamilton, Scott, LaChapelle, & O'Sullivan, 2016), behavior towards technology usage (Ahn et al., 2016), behavior towards information system adoption (Rana & Dwivedi, 2015) and other behaviors that focuses on belief system and behavioral outcome.

Although personal cognitive appears to be a relevant construct in examining individuals' knowledge sharing process, there has not been many studies being done on online settings (Cabrera et al., 2006). Identifying personal cognitive factors of online community members' may provide meaningful insight into the concept of stimulating knowledge sharing in online communities, as Social Cognitive theory assumes that a person's behavior is formed based on personal cognitive (Bandura, 1989, 1997a).

2.8.1 Self-Efficacy

Self-efficacy is "individual beliefs in his ability to organize and execute a required action to produce given attainments" (Bandura, 1997a, p. 3). Social Cognitive theory predicts that self-efficacy will influence the ability of individuals to perform a task or a behavior (Bandura, 1986). Studies from Bandura and other scholars have shown that a person's tendencies to get involved in any action is deeply influenced by individuals self-efficacy (Bandura, 1997a). The relationship between self-efficacy and one's behavior have been established by psychologists in several applied fields (Bandura, 1997a). Such studies demonstrate that self-efficacy influences a person's choices, goals, effort, coping, persistence, and performance (Cherian & Jacob, 2013). In addition, studies of organizational settings have demonstrated the positive effect of self-efficacy across a wide range of organizational outcomes. This includes sales

performance (Barling & Beattie, 1983), computer training performance (Johnson & Marakas, 2000) and information technology usage (Lam & Lee, 2005).

It should be noted that a person aiming to increase competency is motivated by their own internal personality. A person that puts a higher value on their identity is typically self-encouraged to perform a task. This observation can also be applied to online communities. Individuals who participate in online knowledge sharing are usually those who believe in their own ability (Cabrera & Cabrera, 2002). In turn, this will encourage other members to share their knowledge in online communities. Similarly, sharing knowledge with others may enhance online community members' level of learning and self- efficacy. According to Bandura (1997a), individuals who doubt their own ability will avoid performing certain tasks or behaviors. Therefore, self-efficacy is expected to be a major determinant in knowledge sharing behaviors among online community members.

2.8.2 Outcome Expectancy

Moving on, outcome expectancy is a belief that one will gain possible outcomes after accomplishing a task (Compeau, Higgins, & Huff, 1999). It is can also be defined as the belief of consequential choices (Bock, Zmud, Kim, & Lee, 2005). Researchers have suggested that a person is stimulated by a behavior that is most likely to result in favorable outcomes (Bandura, 1994; Bock et al., 2005). Members will be more willing to share their knowledge if such behavior is aligned with their own knowledge goals and needs (Van den Hooff & de Leeuw van Weenen, 2004). They may also be more willing to share their knowledge if they expect a returned of knowledge from other employees (Bock et al., 2005). There has been a number of researches that shows the positive correlation between positive expected outcome of a behavior with the likeliness of individuals to engage in said behavior (Chiu et al., 2006; Hsu et al., 2007).

Moving on, there are two dimensions of outcome expectancy which are personal outcome expectancy and performance outcome expectancy. According to (Compeau et al., 1999), performance-related outcome expectancy were found to influence job performance. Meanwhile, personal outcome expectancy is related to a change in personal image or rewards, such as promotions, raises, or praises. In this study, personal outcome expectancy refers to one's community judgment on one's knowledge sharing (i.e., gaining recognition and respect, making friends, or getting better cooperation in return). Performance outcome expectancy refers to the work-related consequences that individuals might gain from knowledge sharing (i.e., achieving goals and completing tasks more efficiently).

In this study, personal outcome expectancy refers to the online communities' virtual leader's judgment on the possible consequences of the four components of leadership behaviors on themselves. On the other hand, community-related outcome expectancy is the judgment on the possible consequences of the four components of leadership behavior on the community. Previous studies have demonstrated that the expected personal benefits (e.g., rewards, image, reciprocity and enjoyment in helping others) have considerable effects on knowledge sharing (Bock et al., 2005; Kankanhalli et al., 2005).

With regard to outcome expectancy for knowledge sharing, several studies show that online communities' members share their knowledge for personal outcome (e.g., recognized as a knowledgeable and skilled person, enriching knowledge, getting respect from members and others) and performance outcome (e.g., increase problem solving skills and getting tips to complete a task) (Andrews, 2002; Butler et al., 2002).

2.9 Task Characteristics

Apart from followers' characteristics, tasks characteristics also have a major impact on the influence of a leader's behavior on followers' motivation (see Figure 2.6). Theoretically, the Path-Goal theory approach suggests that leaders need to choose a leadership behavior that is the best fit for the needs of followers and the task that they are doing. Task characteristics include the design of the follower's task, the formal authority system of the organization, and the primary work group of followers (Northouse, 2016).

Furthermore, in online programming communities where tasks are managed by members voluntarily, the followers still need the support of a leader. This is especially true when the members find out the tasks are ambiguous, or the tasks are difficult. In these situations, leaders need to provide clear direction of the task, guiding them in coding and create a vision of the final product of the project. A leader is also needed to moderate the discussion by providing rules and regulation in preventing conflicts among community members. Directive leadership is suitable in these situations by providing guidance and psychological structure to the followers (House & Mitchell, 1975). For a beginner to share their knowledge and ask questions, they need someone to explain to them the whole nature of the online programming community they are joining. This includes topics of discussion, the goals to be achieved, the ranking, being a good contributor and the regulations of the online community. Therefore, beginners will be needing directive leadership to move forward. It can be seen that directive behavior is important to achieve clear, specific goals and to attain knowledge sharing in online communities (Bryant, 2003).

Moreover, participative leadership is best implemented when the task is ambiguous. This is because participative leadership will provide better clarity regarding the methods to complete a task (House & Mitchell, 1975). In addition, participative leadership will have a positive impact when followers are autonomous and have a strong need for control. This is because most followers respond positively to being involved in decision making and the structuring of work.

Moving on, a situation with structured task, strong group norms, and established authority system will not require much guidance from a leader. This is because, in such situations, the methods of completing a task are apparent. Followers will be confident that they can accomplish their work and that their work is of value. A leader in these situations may become unnecessary, un-empathic, and excessively controlling (Northouse, 2016). This participative leadership behavior suits experts who participate in the online programming community. These experts are likely to share their skills and experience, accomplish the task, and discuss ideas with other members. Members are more inclined toward a participative leader that allows members to choose their own project and content.

Furthermore, Path-Goal theory predicts that achievement-oriented leadership is most effective in settings where followers are required to perform challenging tasks. In such settings, leaders who challenge and set high standards for followers will raise followers' self-confidence in their ability to reach their goals. Achievement-oriented leadership helps followers to feel that their efforts will result in effective performance. Nonetheless, achievement-oriented leadership seems to have no impact in settings where the task is more structured, less ambiguous and less challenging.

Moving on, in online programming community, this leadership behavior can guide members who are passionate toward challenges and self-reward. These types of followers require an achievement-oriented leader who can create a motivated environment for them to achieve internal and external satisfaction. This leadership behavior also encourages members from all parts of the world to contribute more creative and innovative ideas, hence producing more quality projects. Consequently, the contribution will expand the knowledge repositories that benefit members worldwide.

For tasks that are perceived as unsatisfying or frustrating, Path-Goal theory suggests that leaders should use a supportive behavior. A supportive leader guides the followers when they are engaged in tasks that are complex, mundane and mechanized. Supportive leadership offers a human touch for followers. In these situations, leaders are aware of the needs and well-being of the followers by accomodating their needs and being empathetic and friendly. Such leaders treat their followers with respect and support them when necessary. This is useful in situations when the follower has problems, lack of self-confidence or is temporarily demotivated.

Path-Goal theory is straightforward. An effective leader has to attend to the needs of followers, helps followers to define their goals and the paths they want to take. When obstacles arise, the leader is required to help followers confront said obstacles. This may include guiding the follower in solving the problem or removing it completely. A leader's job is to help followers reach their goals by directing, guiding, and coaching them. This will create an environment that attracts followers to participate in enhancing and enriching an online programming community.

2.10 The Strength and the applicability of Path-Goal theory in this study

There are several advantaged to Path-Goal theory. Firstly, the Path-Goal theory provides a useful theoretical framework to understand the extent to which various leadership behaviors affect followers' satisfaction and work performance. It is one of the first theories to acknowledge four conceptually distinct varieties of leadership that are (directive, supportive, participative, and achievement-oriented) (Northouse, 2016). The Path-Goal approach is also one of the first situational contingency theories of leadership that explain the impact of tasks' and followers' characteristics on followers' performance. Thus, Path-Goal theory provides a model that is very practical in certain ways. The model highlights the important ways leaders can help followers. In its simplest form, the theory reminds leaders that the overarching purpose of leadership is to guide and coach followers to achieve a goal.

In this study, this theory is utilized as a process that the leaders use the four leadership behaviors to suit the online members' needs and the environment that they are in. The role of a leader is to encourage online members to share knowledge in an online community and assist them in reaching their goals by motivating, directing and guiding them. Leaders' are also required to evaluate task and investigate the motivation factors of online members through appropriate leadership behavior.

Another theory used in this study is the Social Cognitive theory (SCT). This theory is adopted to study the followers' characteristics in Path-Goal theory because Path–goal theory suggests that each type of leader behavior has a different impact on followers. Determining if a particular leader behavior is motivating to followers is contingent on the followers' characteristics and the characteristics of the task. Thus, in this study, supportive leadership, participative leadership, achievement-oriented leadership and

directive leadership behaviour are selected to study the moderating effect of these leadership behaviors to respectively moderates self-efficacy and outcome expectancy of the followers (members of online programming community) which is adopted from social cognitive theory. This two variables also used to measure the ability and perceived outcome of the members' of online programming community to share their knowledge. These leadership behaviors of a leader are important in an online programming community because it is assumed to boost the motivation of the followers to participate in knowledge sharing. By integrating the four leadership behaviours in moderating the followers' personal cognitive attributes (self-efficacy and outcome expectancy) will lead to an understanding of how leaders and followers interact to strengthen their relation toward increasing knowledge sharing behaviour among members.

2.11 Summary

In this chapter, we have seen a comprehensive assessment of the previous literature on an online community, knowledge sharing, and virtual leadership behavior. There are several factors that have a significant impact on knowledge sharing behavior in both physical and online settings. The next chapter will present the conceptual framework of this study. This includes the base models and their contribution in the study as well as explaining the hypothesis in greater detail.

CHAPTER 3 :

CONCEPTUAL MODEL

3.1 Introduction

This chapter presents the framework of the study in accordance to Chapter 1. The main purpose of this study is to model and validate the contributing factors of virtual leadership behavior towards knowledge sharing in online programming communities. This chapter demonstrates a conceptual research model and formulates hypotheses based on the foundation of the related theories that has been proposed. There are three sections to this chapter – conceptual research model, research hypothesis and the overall relationships among independent, dependent, and moderating variables.

3.2 Theoretical Framework

A theoretical framework is made of time-tested theories that embody the findings of numerous investigations on how a phenomena occur (MacFarlane & O'Reilly-de Brún, 2012). This study is grounded on Path-Goal Theory. In addition, this study examines the role of participative leadership, supportive leadership, achievement-oriented leadership and directive leadership towards moderating the relationship between personal cognitive factors namely Self-efficacy (SE) and Outcome Expectancy (OE) and knowledge sharing in online programming communities. These leadership behaviors are integrated to examine their application and relationship towards knowledge sharing in a virtual environment. These leadership behaviors are important

in online programming community based on the assumption that it may increase members' motivation to contribute and share their knowledge.

3.3 Conceptual Framework and Justification of the Hypotheses

A conceptual model and related research hypotheses are presented to address the research questions. The model is established based on an integrative literature review and consideration of the theoretical relevance among the suggested constructs. Following paragraphs are the justification and suggestions of hypotheses following the conceptual framework in Figure 3.1:

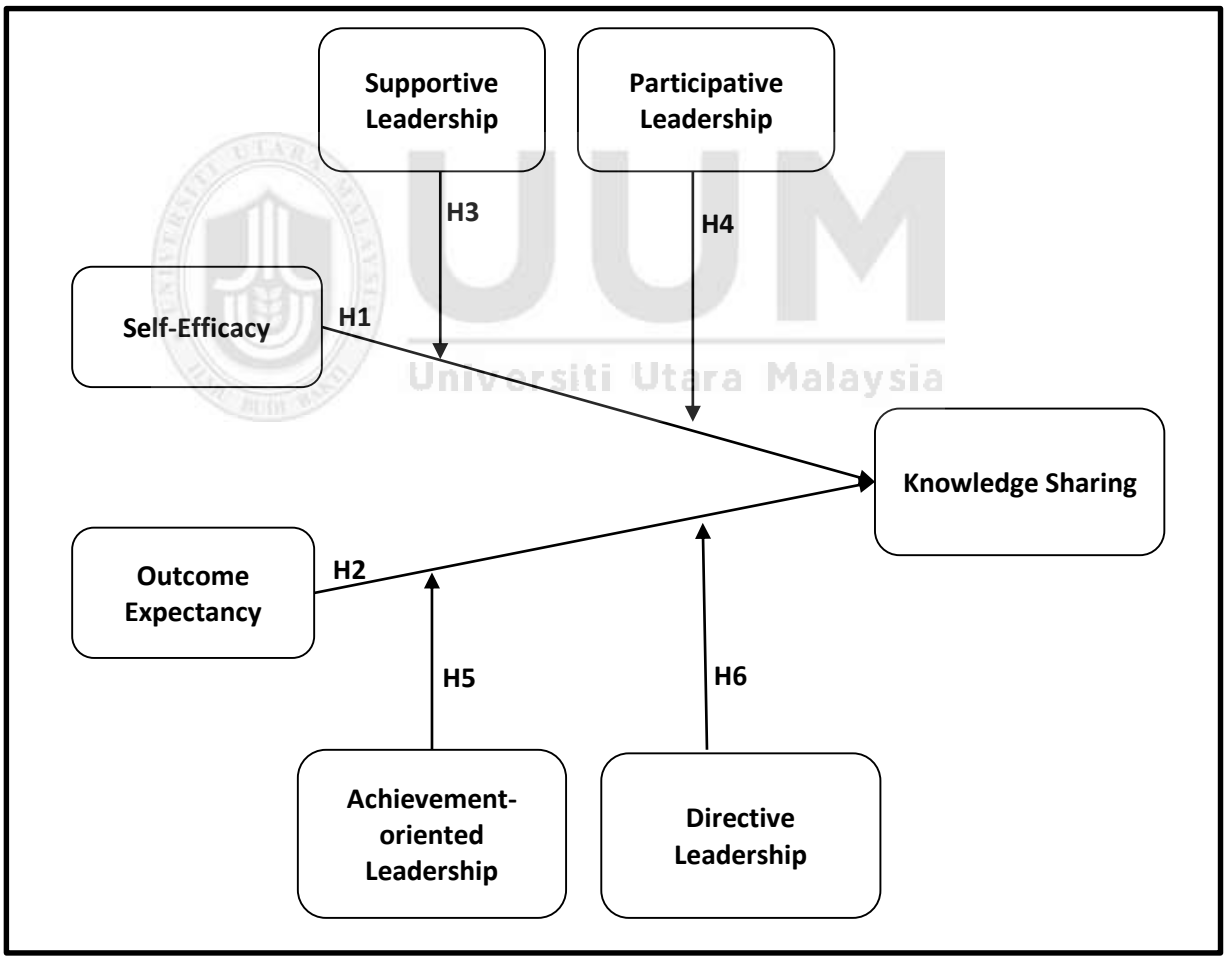


Figure 3.1. Conceptual Framework

3.3.1 Self-Efficacy effect on Knowledge Sharing

Bandura (1986) defined self-efficacy as individuals' perception on what they can do with the skills they possess. There is an extensive collection of literature that reveals the powerful role and the variety of roles that self-efficacy plays in both motivation and performance (Androulaki-Ralli, 2015; Bandura, 1997b; Combs & Luthans, 2007; Faraj et al., 2011). The relationship between self-efficacy and intentions is explicitly recognized by Bandura (1997b): "Beliefs in personal efficacy affect behavior both directly and by influence on intentions" (p. 284). The concept of self-efficacy has been observed to predict the actions and attitudes in a variety of contexts and sample types. This concept can also be used to predict actions in highly complex tasks (Bandura, 1989; Kuhn & Yockey, 2003).

It is worth noting that self-efficacy is one of the most validated and researched theory of motivation across subject and task types (Bandura, 1997b). Therefore, this concept is an ideal base theory in understanding the reasons underlying people's behavior in certain contexts. Previous studies demonstrate that individuals with a higher judgment of self-efficacy are more likely to cooperate (Lu, Leung, & Koch, 2006). In a community, a member's perception, understanding, attitudes, and feelings about himself and his or her relationship toward his community and to other members are believed to influence the extent of his/her own knowledge sharing.

Moving on, knowledge sharing requires context compatibility. For example, employees who share certain professional similarities such as work interests or values tend to engage in knowledge sharing together (Huang et al., 2014; Wah, Loh, Menkhoff, & Evers, 2005). Self-efficacy researches state that self-efficacy to share complex knowledge will positively predict the action of knowledge sharing (Bock & Kim, 2001; Cabrera & Cabrera, 2002; Kankanhalli et al., 2005). Therefore, it can be assumed that

self-efficacy in the ability to share knowledge would predict actual knowledge sharing activity.

In the online context, self-efficacy is regarded as an intrinsic benefit. In other words, it is another essential motivator of knowledge sharing behavior (Liao, To, & Hsu, 2013). Self-efficacy is enhanced when individuals believe in their ability to contribute their valuable knowledge to the community. Researchers have also reported the positive relationship between self-efficacy and knowledge sharing (Liao et al., 2013; Zhang et al., 2017). Therefore, we assume that individuals with higher self-efficacy will contribute more in online programming community. Consequently, the following hypotheses on self-efficacy are presented:

H1: Self-efficacy has a positive effect on knowledge sharing.

3.3.2 Outcome Expectancy effect on Knowledge Sharing

Outcome expectancy is an individual's belief that performing a certain action will lead to the desired outcome (Bandura, 1986). This study argues that outcome expectancy positively affects an individual's knowledge sharing. In this research, outcome expectancy is defined as the consequence of an act, not the act itself. Previous studies show that if employees believe that they can improve their relationships with other employees by offering knowledge, they will be more willing to share their knowledge with others (Chiu et al., 2006; Connor & Callahan, 2015; DiSalvo, 2014; Dong et al., 2016; Wasko & Faraj, 2005; Xu, Jones, & Shao, 2009).

Following this, the willingness of members to share their knowledge can occur if they are aware of their own knowledge needs and goals (Van den Hooff & de Leeuw van Weenen, 2004). Such behavior can also be motivated if they expect reciprocal

knowledge sharing from other coworkers (Bock et al., 2005). Studies have shown that the higher the positive expectancy of a behavior, the more likely an individual will engage in said behavior (Chiu et al., 2006; Dowling & Rickwood, 2016; Hsu et al., 2007).

In this study, outcome expectancy refers to an individual's personal expectations of an outcome of certain behavior that encourages them to share their knowledge. According to Social Cognitive theory, individuals are more likely to engage in a behavior with favorable consequences. Several studies in information system research support this notion. One study discovered that personal-related outcome expectancy had a significant effect on computer usage (Compeau & Higgins, 1995). Another study demonstrated that outcome expectancy significantly affect computer end user's organizational commitment (Corrado, Anthony, & Firestone, 1996).

Some studies such as (Andrews, 2002; Zhang & Hiltz, 2003) suggested that individuals share knowledge within online communities and expect knowledge enrichment, support, and new networks. Meanwhile, Butler et al. (2002) suggested that the primary reason for individuals to engage in knowledge sharing is their expectation to be seen as skilled, knowledgeable or respectable. Other studies suggested that individuals share knowledge to help the online community to accumulate its knowledge, continue its operation, and grow (Bock & Kim, 2001; Kolekofski Jr & Heminger, 2003; Lesser, 2000). From these, this study proposes that outcome expectancy affect knowledge sharing behavior, and proposes the following hypothesis:

H2. Outcome expectancy has a positive effect on knowledge sharing behavior.

3.3.3 Supportive Leadership behavior moderates the effect of self-efficacy on knowledge sharing

Supportive leadership addresses the requirements and preferences of the followers. Leaders with this quality show concern for their followers' well-being and foster a pleasant and friendly organizational setting (House & Mitchell, 1975). Supportive leadership includes instrumental and emotional elements. The former is applied to make one's life easier while the latter is to ease interpersonal communication (Dinh et al., 2014).

In traditional organizations, Connelly and Kevin Kelloway (2003) observed that supervisor's encouragement and support of knowledge sharing are pertinent in creating a positive knowledge sharing culture. Cabrera et al. (2006) emphasized that perceptions of support from supervisors an important organizational variable in influencing an individual's knowledge sharing behavior. This might be due to the subtle pressure of normative behavior on individuals.

Prior research such as the one conducted by (Kelloway & Gilbert, 2017) suggested that supportive leadership acts as a medium between the well-being of the employees and their motivation level. This research proved that supportive leadership recognize employees individually. The authors also stated that staffs recognition are seen as a motivational booster, particularly when the leaders are supportive towards their work (Kelloway & Gilbert, 2017). This leadership behavior has also been proven to significantly facilitate knowledge sharing among employees (Akpotu, 2013). Apart from that, followers who are supported by their leaders have better ability to achieve their goals (La Rocco & Jones, 1978). It was also observed that employees who work with supportive supervisors are more satisfied and have higher confidence in their work.

Moreover, Avolio (1994) explained that leaders who show more individualized consideration have better followers' retention and performance in organizations.

According to Mansouri (2016), supportive leadership behavior can enhance employees motivations. Leaders' support boosts work morale and helps to increase employees' self-confidence. In turn, performance level remains optimum and the employees are always motivated (Chih et al., 2018). Podsakoff, MacKenzie, Moorman, and Fetter (1990) noted that individualized support is an act of leaders who take into consideration their followers' specific needs. In addition, Korzynski (2013) shows that supporting members online is useful in building trust, encouraging members to use online social networks, exchange of ideas and engaging in online teamwork. Therefore, the leaders must be able to inspire and motivate their followers to the point that they acknowledge the community as a part of their life and career. The leaders should also make an effort to relate to the need of the followers', because leaders should note that members are the pillars for successful online community and these pillars should be strong enough to support the entire beam line of the community. In online communities, the main characteristic of the members is voluntary behavior. Without a strong motivation, it is difficult to encourage members to share their knowledge (Ipe, 2003). Supportive leaders can achieve that level of motivation. In this study, supportive leadership moderates the relationship between self-efficacy and knowledge sharing. Through the motivational mechanism of supportive leadership, leaders energize members by articulating a compelling vision and providing an appropriate model. A virtual leader may empower members' efficacy via knowledge sharing (Kirkpatrick & Locke, 1996; Yukl, 1999).

Moreover, inspirational motivation in supportive leadership can enhance self-efficacy too. By inspiring individuals with their passion, supportive leaders underpin individuals' willingness and ability to work on improving the status quo. The more

frequent a follower is motivated by the leader, the higher the follower's self-confidence in becoming an active member of the online programming community. Supportive leadership will also cultivate a stronger bond between the leaders and the followers. This will motivate them to contribute in online community settings via knowledge and ideas sharing. Therefore, we assume that individuals in the online community who are supported by the leader will have a high level of self-efficacy toward knowledge sharing in the online programming community. That is to say that;

H3: Supportive leadership behavior positively moderates the effect of self-efficacy on knowledge sharing.

3.3.4 Participative Leadership behavior moderates the effect of self-efficacy on knowledge sharing

Participative decision-making or participative leadership is a collaborative decision-making process that involves both leaders and followers (Koopman & Wierdsma, 1998). According to Malinen (2015), participation is a transformation of the consumer to creator. This transformation from newcomer to an experienced member has also been described as a movement from the periphery to the center of the community. In a physical organization environment, participative leaders provide their followers the chance to contribute their perspectives, consult leaders on decision making and collaboratively make a decision with their followers (Rapp, Ahearne, Mathieu, & Schillewaert, 2006). An organization's evolution begins when it starts to rely on their members' decision making (Arnold, Arad, Rhoades, & Drasgow, 2000a). In addition, participative leadership has also been used for customers to get involved in brand engagement and give their opinion on a product (Lam, Huang, & Chan, 2015).

Moving on, past studies have shown that participative leadership behavior increases followers' commitment (Sashkin, 1976), engagement (Tuckey, Bakker, & Dollard, 2012), satisfaction (Yammarino & Naughton, 1992), and performance at work (Vecchio, Justin, & Pearce, 2010). In addition to the privilege provided to the followers, an environment established by participative leadership will also improve the quality of decision making (Scully, Kirkpatrick, & Locke, 1995). Participative leadership also integrated in understanding employee-customer feedback generation and employee-customer relationship maintenance (Angermeier, Dunford, Boss, & Boss, 2009).

Lam and Schaubroeck (2002) defined participation self-efficacy as the extent to which an individual believes that he or she has the ability and skills to successfully participate in decision-making processes. In a physical organization, an employee might not be able to grasp the technical elements involved in a particular decision and assume that the topic is too complex for them to make a valuable contribution. These individuals doubt their ability to provide meaningful input, causing them to disengage and defer to their teammates. This is highly common when there is an expert present during a team's decision-making meeting. In such situation, team members may assume that they do not possess the expert's depth of knowledge, and choose to not provide any input at all (Thompson, 2007).

Moreover, in traditional organizations, a team member who does not believe strongly in his argument tends to not defend their viewpoints (Thompson, 2007). This conscious decision is the expression of disengaged behavior or a voice called acquiescent silence, which is the act of intentionally withholding ideas, information, and opinions (Dyne, Soon and Botero, 2003). Eventually, this will lead individuals to limit their involvement. This is typically referred to as self-limiting behavior (Mulvey, Veiga, & Elsass, 1996), and is a common cause of decision making pitfalls.

Furthermore, participative leadership leader can include members' participation by showing gratitude for their meaningful involvement. Leaders can also stress the importance of community-based decision-making process by relaying the fact that it can strengthen and improve the community (Janssens & Brett, 2006). Therefore, leaders should be aware of members' self-efficacy and create an environment that empowers members to share their views and ideas.

Since most online programming communities are on a voluntary platform, participative leadership behavior can include members to decide on their own creative and innovative ways of contributing. Participative leadership in a voluntarily online community are assumed to be beneficial for the community to grow and expand their empire. In this study, the research model suggested that participative leadership influences members' self-efficacy toward knowledge sharing in online programming community. Moreover, participative leadership behavior cultivates followers ''psychological ownership'' (Sashkin, 1976), increase followers' feelings of self-efficacy and control, and reduce their sense of powerlessness (Arnold et al., 2000b). It should be noted that it is challenging to implement participative leadership in an online community because it is not a face-to-face interaction. Nevertheless, creating an environment that allows members to have a sense of ownership will make them feel responsible and feel that they belong to the particular online community.

Moving on, prior research suggests that participative behavior of a leader plays a vital role in providing followers self-worth and self-determination (Deci et al., 1989). Some authors have also suggested that participative leadership is likely to induce the feeling of empowerment among followers (Ahearne et al., 2005; Leach et al., 2003). Psychological empowerment has been conceptualized as a form of intrinsic motivation to perform tasks. This concept is manifested in four cognitive dimensions: meaning,

impact, competence, and self-determination (Conger & Kanungo, 1988; Spreitzer, 1995; Thomas & Velthouse, 1990). Allowing members to choose their own project will foster a sense of empowerment and trust between the followers and the leaders, and in turn, enhancing members' participation and performance (Huang et al., 2009). Based on these justifications, the following hypothesis is formulated.

H4: Participative leadership positively moderates the effect of self-efficacy on knowledge sharing.

3.3.5 Achievement-oriented Leadership behavior moderates the effect of Outcome Expectancy on Knowledge Sharing

As mentioned before, achievement-oriented leadership is characterized by a leader who challenges followers to perform work at the highest level possible. Bonau (2017) states that one of the leadership behavior that motivates employee commitment is a behavior that is result-driven. This is similar to achievement-oriented leadership. Okumbe (1998) argues that effective leaders develop goals that are stimulating and challenging (Okumbe, 1998). Similar standard and quality setting also exist in online communities setting. For instance, a study in online innovation communities like Mozilla open source project revealed that reviewers set a high standard process by shaping and evaluating individual contributions and by ensuring high quality of the project's master code repository before integrating it with other projects (Kononenko, Baysal, & Godfrey, 2016). This can also be seen in Wikipedia, where peer review on articles is ever on-going. An article may undergo a series of edits by contributors. When editing an article, the contributor will have first reviewed the prior content of the article, and then makes his/her own modifications. The contents that passed through the new edit indicates current contributor's approval. If the content is approved by reviewers with a higher

authority, it is expected to be of better quality (Hu et al., 2007). Nichols and Twidale (2002) who studied what motivate developers in voluntary online open source project revealed that the intrinsic challenge of tackling a hard problem encourages the developers to contribute. They also observed that projects that are less challenging are less likely to be chosen by the voluntary developers. This shows that leaders who challenge their followers increase their followers' self-confidence in complex situations (Moorhead & Griffin, 2012). This increases followers' commitment to their organization's mission, values, and goals (Choi, Tran, & Park, 2015).

Furthermore, achievement-oriented leadership guides and gives members a sense of purpose. Every member of the online communities has particular goals that they want to achieve. This leadership behavior can help followers to attain specific goals that may lead to external and internal reward. Creating an achievement-oriented environment and understanding members' personal goal and expectation of knowledge sharing will increase their contribution. Therefore, achievement-oriented environment in online programming community will create value internally and externally for followers. It will also motivate them to contribute in an effort to reach the community's goals, achieve their target and expand the community's empire. From these, the following hypothesis is formulated:

H5: Achievement-oriented leadership behavior of virtual leader positively moderates the effect of outcome expectancy on knowledge sharing.

3.3.6 Directive Leadership behavior moderates the effect of Outcome Expectancy on knowledge sharing

Directive leadership characterizes a leader as someone who instructs the followers on their task. Rabbani, Imran, Shamoon, and Kamal (2017) defined directive leadership as

a way to ensure the generation of peak performance in the organization. This approach has been implemented on those who lack expertise related to the said accomplishment and work goals. Nonetheless, implementing this leadership behavior on expert individuals can backfire (Rabbani et al., 2017).

In online settings, members are usually involved in different types of tasks. For instance in Wikipedia, the main task is creating articles while in online programming communities, the main task is developing applications and sharing codes. Coordinating task behavior of a leader is crucial to lead members to work on the objectives of these tasks. (Wang & Lantzy, 2011). Directive leadership is needed to guide members and give instructions related to their tasks. Guidance from leaders with expertise on a particular task will increase the members' expectancy of the vision created by the leader to achieve the defined goals (Kirkpatrick & Locke, 1996; Yukl, 1999).

Moving on, directive leadership behavior also clarifies the roles and responsibility of the employees and the rule and regulations of an organization. This is done to successfully achieve the organizational objectives (Mesu, Sanders, & Riemsdijk, 2015). As mentioned before, Northouse (2016) stated that a directive leader creates rules and regulations to avoid conflicts. This is a form of "implicit contract" established to create a healthy environment that may motivate other members to engage in favorable behaviors. Previous studies believe that this will protect the community from conflicts that will affect the goal and quality of the established community. Regulating behavior in the online community has become increasingly important due to the increase of cyberspace threats such as flaming, spamming or virtual crime (Sun, 2014). An inherent challenge that faces all online communities is how to discourage negative behavior

while encouraging open communication and cooperation among members (Kiesler, Kraut, Resnick, & Kittur, 2012).

Apart from that, several studies in online communities observed the differences between behaviors accepted by online and physical communities. For instance, Wikipedia communities rely on a set of policies stated in the fundamental principles of Wikipedia called “pillars of Wikipedia." One of the policies is civility. This rule requires all members to refrain from making personal attacks and to be cooperative. If a person is insulted or attacked on Wikipedia or bursts into anger and retaliates, both the attacker and the attacked may face some consequences such as being blocked from editing any article (Jemielniak, 2015).

Additionally, the policy system is created and governed by administrators in Wikipedia to manage conflict and plagiarism (Kraut, 2010). Another policy being imposed to Wikipedia contributors is to adopt a neutral point of view when writing articles. Meanwhile, in Psych Central, a site with 160 health support communities, denies its members from using the website to conduct any type of event for educational purposes or publication (Jones, 2008). In another online communities, JoBlo's Movie Website only allows posts relating to the topic on its forums (Sun, 2014).

Generally, in online communities, the standard of behaviors might be noted in the community, altered or left implicit. It may also be challenged by community members from time to time. In other words, it may be difficult to reach a full consensus from the communities regarding the regulations imposed on them. Having directive leadership can provide members with guidance, clear expectations, and better vision. With clearer goals in mind, members will have a better sense of outcome expectancy that will motivate them to contribute to online communities. Moreover, directive regulative

behavior in online communities can avoid conflict and eliminate abusive behavior. Thus, we hypothesize that:

H 6: Directive leadership of virtual leader positively moderates the effect of self-efficacy on knowledge sharing

3.4 Chapter Summary

This chapter discussed the reasons for using the Path-Goal theory and Social Cognitive theory as a theoretical framework in this study. It also discussed the reason for developing the conceptual research framework by joining two theories together to become a hybrid theory. Furthermore, this chapter also explains the relationships among independent variables, dependent variables, and moderating variables. Moreover, this chapter demonstrates the research hypothesis proposed for the current study. Chapter 4 will extensively discuss the methodology adapted to answer the research questions.

CHAPTER 4 :

RESEARCH METHODOLOGY

4.1 Introduction

This chapter discusses the methodology, approach, strategy, and techniques used in this study. In the first four sections of this chapter, the adopted research philosophy, the research design, research methodology, sampling design and method used to collect data from a targeted sample were discussed. The following sections discuss the data analysis technique (i.e. partial least squares) and the statistical analyses used to assess the research model.

4.2 Research Philosophy

There are three existing research philosophies, namely positivism, constructivism, and realism. Positivists believe that the goal of a research is to explain a phenomenon that can be observed and measured directly through quantitative means through the scientific process, by systematically and statistically examining the relationships that exist among variables (Holden & Lynch, 2004; Sekaran & Bougie, 2011). Meanwhile, constructivism is concerned with an in-depth understanding of a phenomenon. They believe that the world is subjective and socially constructed. Constructivists use qualitative research methods such as focus groups and interviews (Holden & Lynch, 2004; Sekaran & Bougie, 2011). Realists are the middle ground of positivism and constructivism. They believe in an objective reality (external truth), but they reject the claim that external reality can be measured objectively. In addition, realists believe that researchers are naturally biased and should, therefore, use triangulation method to gain

a deeper understanding of a research subject (Holden & Lynch, 2004; Sekaran & Bougie, 2011).

Taking these views into consideration, this study decided to adopt a positivist view because of several reasons. Firstly, the variables examined in this study have been investigated previously and empirically. Therefore, this research further explained the relationship between the variable in a different context. Secondly, this study is interesting in testing existing theories. Thirdly, through operationalization, the variables examined in this study were reduced into smaller elements to enable quantitative observation and measurement. The researcher is also independent of the subject being researched.

4.3 Research Design

The research design is the blueprint for a study and specifies the procedures that are to be followed by a researcher to achieve research objectives whether it is descriptive, exploratory or causal. (Kumar, Talib, & Ramayah, 2013). Exploratory research is conducted when there is a lack of information on a topic and it involves gathering qualitative data through qualitative approaches (Holden & Lynch, 2004; Sekaran & Bougie, 2011). Meanwhile, descriptive studies are carried out in an attempt to describe a research topic. The descriptive research design is suitable to investigate the relationships between variables and to define particular situations or populations (Holden & Lynch, 2004; Sekaran & Bougie, 2011). While,causal studies are done to determine if a variable affects another. It is conducted to investigate cause-and-effect relationship between variables (Holden & Lynch, 2004; Sekaran & Bougie, 2011).

This study is descriptive and it is adopted because the research objective is to define the nature of relationships that exist between variables. This study is also correlational

and surveys (questionnaires) were used for data collection. Third, this study is cross-sectional study as the data for this study were collected once. Finally, the level of the researcher's interference in this study was minimal.

4.4 Research Process

The research process is an efficient and logical look for related information on a specific topic. It includes characterizing and rethinking the researched issues and

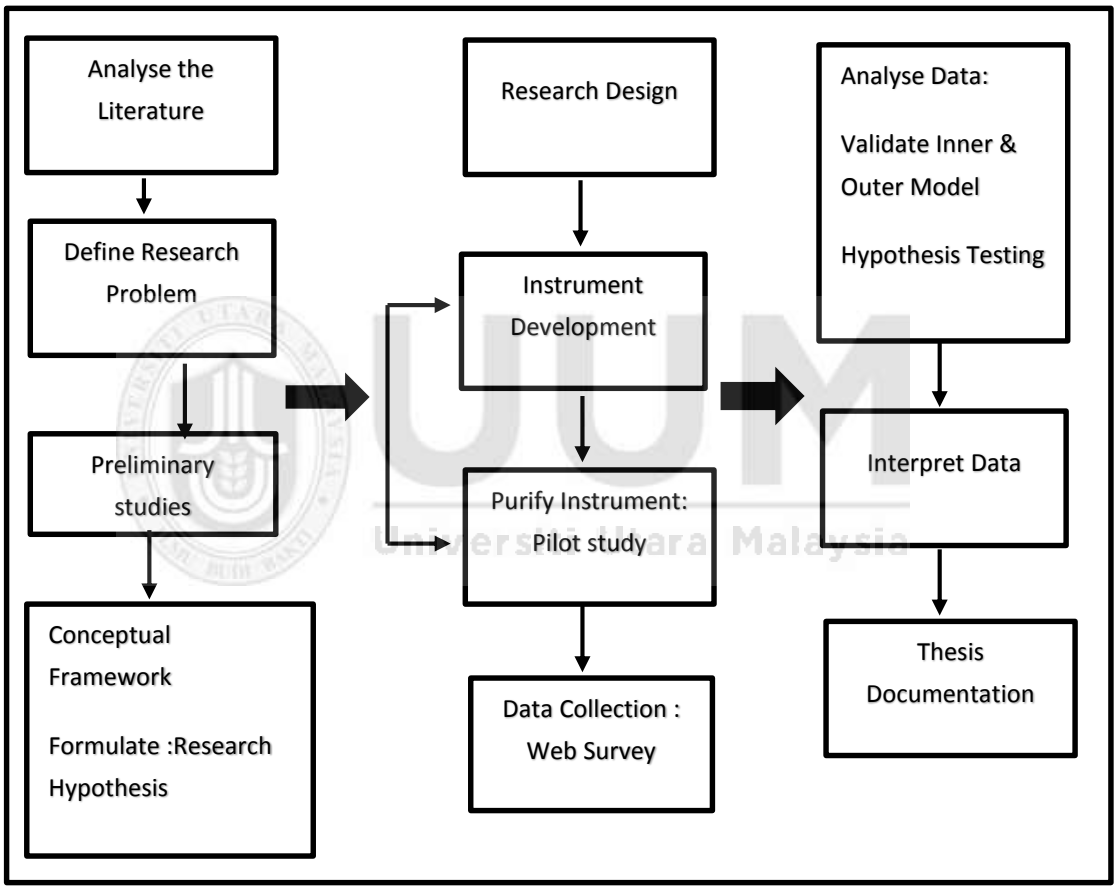


Figure 4.1. Research Process for this Study

constructing that will assist in deriving some possible conclusions. Finally, the conclusions are tested against the hypothesis constructed (Kothari, 2004). Figure 4.1 demonstrates an overview of this study's research process.

4.5 Research Approach

The research approach is the qualitative or quantitative designs that affect the strategies in research methodology (Creswell, 2013). It is also a concern in answering an arrangement of research questions and research objectives. Determining an approach is important in leading the research and influencing the results (Creswell, 2013).

The positivistic view adopted by this study caused more focus being put on the evaluation of data collection, analysis, and theory testing (Bell & Bryman, 2007). Furthermore, the relationship among factors is broken down through statistical procedures (Creswell, 2013). There are two common research approaches in quantitative studies; survey research and experimental research (Creswell, 2013). This study adopted a survey research approach to providing standardized information in depicting constructs or studying the relationships between constructs (Malhotra & Grover, 1998). The approach is also taken to help to concentrate in collecting data from the respondents in answering research questions of "what-type" that requires survey approach methodology. As indicated by Yin (2003), a survey research methodology is a reasonable when researches are attempting to answer the 'who' and the 'what'-types of questions.

4.6 Data Collection Technique

The next subsections discuss the issues pertinent to the web survey, sampling technique, and the unit of analysis used in this study.

4.6.1 Web Survey

A survey is a deductive approach that is executed through questionnaires and aids in massive data collection from a sizeable population (Saunders, 2011). As indicated by

Bryman (2015), a survey strategy can help to clarify and create models of the relationships of the constructs.

The advancement of the ICT together with the Internet has provided the researches access to an extensive population effectively with minimal cost (Sekaran & Bougie, 2013; Wright, 2005). The focus of this study – the online programming communities – made choosing the online survey method to be the most fitting approach for data collection. The reasons for choosing this approach are listed in Table 4.1.

Table 4-1:

Reasons for Adopting Web-based Survey

Advantage	Explanation
Global reach	Since, this study examines personal cognition toward knowledge sharing moderated by four leadership behaviors in online programming communities. Using a questionnaire that employs pencil and pen seems not appropriate. Henceforth, the benefit of a Web survey that can reach worldwide make it easier and less expensive to acquire data from respondents that are scattered globally.
Attractive Format	An online survey offers varieties expressive and stylistic template in displaying and presenting a survey. Its capacity to present questions in many structures such as (multiple-choice questions, open-ended questions, dichotomous questions and single and multiple responses) make it more appealing and attractive. Likewise, its capacity to channel and control the logic flow is valuable to keep away from confusions.
Fewer unanswered questions	A questionnaire in an online survey possible to be set in a manner where the respondents have to answer the current question and cannot skip to the other following questions.

Ease of data entry and analysis	All the collected responses from the survey will be stored in a database automatically. Thus, it will be much easier to get extracted for data analysis.

Source : Adapted from : Bell and Bryman (2007)

By default, this study uses a survey monkey feature which only allow one survey response per respondent IP address where each respondent can only take the survey once. While, in order to ensure that the web survey received by the intended participants. This study included filtering survey question in appendix A (Q2 and Q6). Where the respondents will be directed to the end of the thank you page if they selected that they have never joined online programming communities before.

Moving on, previous researches on the leadership behavior in non-formal positions of traditional organizations focus mainly on small teams. These studies predominately conceptualize leadership through peer ratings of the leadership qualities of other team members (Pfeffer, Cialdini, Hanna, & Knopoff, 1998; Walter, Cole, der Vegt, Rubin, & Bommer, 2012). Traditional organizations also tend to focus on members' location. This is obvious as these organizations are constructed according to the norms and group dynamics that are often predominated by individual expressions. In addition, there are clear distinctions between members and non-members. On the other hand, online programming communities operate with thousands of active participants that are based on their identification to task or an idea rather than their physical location. As mentioned in Chapter 2, these communities are fluid and exert greater individual control. There are numerous points of exit and entry over time that may change the

fluidity of a particular online community. With these characteristics in mind, web surveys are posted in the wall and lounge area of online communities, inviting members to participate in this research.

4.6.2 Questionnaire Design

The questionnaires in this study were designed with regard to the variables examined in this study. There are three main sections (see Appendix A) in this web survey. **Section A** provides an overview of the research and the definitions of influential members (leaders) and online programming community. Assurance of confidentiality was also clearly stated in this section. In addition, this section also captured the demographic data of the respondents such as gender, age, qualification, online programming community tenure, community ranking, and the category of the online programming community that the respondents' are engaged with. A total of 11 items were determined for the demographic information of the respondents (See Appendix A). All respondents were also invited to participate in a lucky draw to encourage participation in the study.

In **Section B**, respondents are required to answer questions related to the online programming community that they have joined. There were 34 items in the second section and a 5-point Likert scale was used to measure the variables. The scale ranges from 1("strongly disagree") to 5 ("strongly agree") to ensure consistency. In all, there were 45 items (questions) in the survey. (See Appendix B).

4.7 Sampling Design of the Study

Sampling is the process of choosing the right number of population to ensure the validity and generalizability of the research (Sekaran & Bougie, 2013). Selecting a sample is crucial as it mirrors the structure of the online community. In social research,

there may be circumstances where it is not feasible, practical, or theoretically sensible to adopt a random sampling technique (Nunnally & Bernstein, 1978) due to the unavailability of sampling frame (Fornell & Larcker, 1981; Nunnally & Bernstein, 1978). This was the situation for current research as the list of online programming members is not readily available. The sample for this study is selected through purposive sampling because this is a common method for online studies as a sampling frame is not available due to the constant change of members. This study also uses a non-random purposive sampling method to select participants who have personal experience with the phenomenon researched (Galehbakhtiari, 2015). The sample includes programmers in online programming communities who are familiar with programming languages and participate in an online programming community.

Table 4-2:

Sample Techniques Used by Previous Studies in Online Settings

Paper Name / Author year	**Type of Online Community**	**Sampling Technique**	**Journal Impact Factor**
The mediating role of trust and commitment on members' continuous knowledge sharing intention: A commitment-trust theory perspective *(Hashim & Tan, 2015)*	50 selected business online communities	Purposive sampling	Q1 *International Journal of Information Management*
A hermeneutic phenomenological study of online community participation Applications of Fuzzy Cognitive Maps *(Galehbakhtiari, 2015)*	Online communities	Purposive sampling	Q1 *Computers in human behavior*
Exploring Teaching Programming Online through Web Conferencing System: The Lens of Activity Theory	Online programming	Purposive sampling	Q1 *Journal of Educational Technology & Society*

(Çakıroğlu, Kokoç, Kol, & Turan, 2016)			
Motivation and barriers to participation in virtual knowledge sharing communities of practice. *(Ardichvili, Page, & Wentling, 2003)*	Online communities of practice at caterpillar in., a fortune 100, multinational corporation	Purposive sampling	Q1 *Journal of knowledge management*
Volunteers' involvement in online community based software development *(Xu et al., 2009)*	Online community based software development (sourgeforge.net)	Purposive sampling	Q1 *Information and Management*
Knowledge-sharing in an online community of health-care professionals *(Hara & Foon Hew, 2007)*	Online community of health-care professionals	Purposive sampling	Q2 *Information Technology & People*
Tacit knowledge sharing behavior among the academic staff: trust, self-efficacy, motivation and Big Five personality traits embedded model. *(Rahman, Mannan, Hossain, Zaman, & Hassan, 2018)*	Academic staff of higher learning institutions in Bangladesh – in public and private higher learning institutions	Convenience sampling	Q2 *International Journal of Educational Management*
Gender Differences in Self-Regulated Online Learning Environment *(Yukselturk & Bulut, 2009)*	Online programming	Convenience sampling	Q1 *Journal of Educational Technology & Society*
Corporate Wiki Users: Results of a Survey *(Majchrzak, Wagner, & Yates, 2006)*	Wikipedia	Purposive sampling	*Proceedings of the 2006 international symposium on Wikis*

As seen from the Table, a non-probability sampling technique is common in examining individual behavior in an online setting. Although non-probability sampling is often characterized by accessibility, low cost, and ease of collection, this technique makes it

hard to judge the representativeness of a small sample to the large population (Bryman, 2004; Barbie, 2016).

Moving on, Vogt (2007) confirmed that purposive sampling is the most common form of sampling in confirmatory research. Furthermore, purposive sampling helps the researcher to select the respondents who serve the purpose of the study (Zikmund, Babin, Carr & Griffin, 2010; McMillan, 2012). Accordingly, this study adopted a purposive sampling method to target users who had personal experience in using online programming communities and were willing to participate in the survey.

An invitation for members is posted in the Facebook walls of the online programming communities for the first two (2) months. While, the third and fourth months, the invitation have been sent to a lounge area of online programming communities of reddit.com. Lounge area refers to the place where online programming community members can post questions, reply answers, and discuss any topic with other members. The reason why reddit.com (online programming communities) have been used utilised to see whether there is a response bias between Facebook (Online Programming Communities) and Reddit.com (Online Programming Communities) despite this platform also have been recommended by team members in ResearchGate.

Apart from that, the sample size of this study is calculated according to Hair Jr, Hult, Ringle, and Sarstedt (2016) approach, who stated that the estimated minimum sample size in a PLS-SEM analysis should be following the "10 times rule": (1) 10 times the largest number of the formative indicators used to measure one construct or (2) 10 times the largest number of the structural paths directed at a particular construct in the structural model. In this study, there are six structural paths. Following the recommendation suggested by Hair Jr et al. (2016), 60 (6 x 10 the largest number of

structural paths) is the minimum sample size required. Therefore, 60 is the recommended sample size (Hair Jr et al., 2016).

4.8 Ethical Consideration

This study follows the ethical guidelines throughout the data collection to ensure that the research is conducted in an ethical manner; observing the principles of informed consent, respect for privacy, truthfulness, avoidance of conflict of interest and respect for cultural sensitivity (Van Quaquebeke & Felps, 2018). This research is conducted based on the following principles of Treaty of Waitangi - participation, protection and partnership (Wu & Lee, 2017).

Participation: All participants are aware that their participation is voluntary and can be withdrawn at any stage of the research. They are all informed on this matter through the distribution of an information sheet and consent form before they participate in the Web survey for pilot and real studies.

Protection: All questions are generic. There are no sensitive or personal questions except for demographics data. Participations are treated as anonymous and no questions regarding specific practices and culture are required from participants. The principles of privacy and confidentiality are acknowledged.

For privacy issues, respondents are asked to read an information sheet prior to engaging in the data collection process. By participating in the Web survey, they agree to participate in this research. Participants are allowed to withdraw at any time during the data collection process, even after being in middle of answering questions. They are as well informed that their participations are voluntary and assured that any data gathered would remain anonymous.

All of the information collected about the participants is kept strictly confidential. No information on specific individuals completing Web surveys are identified in any report or publication that arises from this research thesis.

Partnership: This research involves a partnership between the researcher and online programming communities members. This study aims to understand better what determines online programming communities members' knowledge sharing behavior. Participants have the opportunity to get a summary of the research findings, which ensures that they are not only involved in providing input for the research but also its process.

4.9 Instrument Development

For this study, qualitative content analysis has been conducted to explore the leadership behaviors exhibited in online programming communities. Then, the validity and reliability of the research instrument are tested using an online pilot survey technique. The following subsections describe the execution of content analysis and the use of pilot survey technique in this study.

4.9.1 Qualitative Content Analysis

According to Hsieh and Shannon (2005), content analysis contributes to the subjective interpretation of the data through a systematic classification process and identifying themes or patterns. In this study, content analysis was conducted as a preliminary study on online programming communities to confirm the existence of four leadership behaviors of path-goal theory. This technique was conducted to analyze the posts and comments published by the moderator of an online programming community. This preliminary study is to find supportive instances that may help to confirm and provide additional explanation on the leadership behavior exhibited in online programming

communities before proposing conceptual model. Proposing that content analysis can aid in understanding the leadership behavior and provide information on how leadership behaviour demonstrated in online programming community before conducting pilot study to check the validity and reliability of the instruments adapted from path-goal theory.

Content analysis consist of conventional, directed, and summative approaches (Hsieh & Shannon, 2005). For a conventional approach, which is also known as inductive category development, it will be appropriate to use this approach. This especially true when there are limited theories on the phenomena. The codes used are derived from the data and defined during data analysis. Meanwhile, for the directed approach (also known as a deductive category), the development is suitable to provide more information on existing theories and the codes are defined before and during data analysis. Meanwhile, the summative approach is more fitting in understanding the contextual use of the word or content. The keywords are derived from the interest of researchers or from the literature review and are defined before and during data analysis.

With regard to the current study, content analysis aims to find examples of the contextual use of the words that indicate an existence and description of virtual leadership behaviors. Therefore, a summative content analysis approach was adopted.

The steps have been taken in conducting content analysis are, first, by getting the definition of the four leadership behaviour of PGT from Northouse (2016) and set the keywords in this definitions as a guideline to find a relevant information on what posted by the moderators. Secondly, selecting 5 online programming (Python, PhP, Java For Life, C sharp Programming, and JavaScript community) communities out of 20 online

programming communities and from each online programming community, five (5) moderators have been selected. This is based on Connelly (2008), which stated that extant literature suggests that a minimum pilot study sample for qualitative studies should be 10% of the sample projected for the larger parent study. While, Treece and Treece (1982) suggested a minimum of 10% of the project sample size. This study analyses 5 out of 20 online programming communities that hold 25% of the online programming communities for the real study.

Next, analyse the post and comments of each of the selected moderator for year 2016 starting from the earliest date posted in online programming communities and see if there any statement that match the description of path-goal theory leadership behaviour defined by Northouse (2016) in table 4.11. The selected verbal team are grouped together accordingly. This preliminary study only to confirm that the four path-goal theory leadership behaviour exist before developing conceptual framework and before validating the instrument of the pilot study . After that, collect all of the categories and examine each in detail and consider if it fits and its relevance. Then, review in order to ensure that the information is categorised as it should be.

It is worth noting that identifying the most influential members is important to understand leadership behavior in an online programming community. The most influential members are called Moderators. This is explained by Ransbotham and Kane (2011), who mentioned that the ultimate active members end up as moderators and leaders of the community. Moderators are defined by the Facebook website as "active community members assigned by the admin to help with managing membership, reviewing posts and have most of the admin privileges with a few exceptions such as changing group settings and removing/blocking another admin or moderator" (Facebook, 2018).

This approach is important in answering our research questions and to identify the types of leadership behavior in online programming communities. The posts and comments containing words and sentences that matched the operational definition of the four type of leadership were noted and qualitatively analyzed. The comments were noted by "copying" and "pasting" them from the Facebook thread to a Microsoft Word document. This document included only the relevant comments that pertained to the first research question. This section of the study is specifically focused on analyzing the posts and comments published by the online programming community's most influential members who also demonstrate certain leadership behaviors. Using qualitative content analysis helps to better conceptualize the four leadership behaviors of Path-Goal theory. The leadership behaviors are directive, supportive, achievement-oriented, and participative. The operational definitions of these behaviors are provided in the following table:

Table 4.11:

Leadership Behaviors as Presented by Northouse (2016)

Leadership Behavior	Description	Some Leadership Keywords
Directive behavior	Enforce rules and regulation and direct followers through issuing instructions and commands.	Reprimands, instruct, order, block, delete, Report, remove, warning,
Supportive behavior	Attempts to ensure friendly and approachable relationships that support fair treatment	Welcoming, Congratulating, Praising, uplifting, helping, guiding, supporting, encourage, inspire, positive feedback

Participative behavior	Attempts to involve followers in the decision-making process to produce better outcomes	Ask to join, ask for opinion, ask for feedback ask for improvement, questioning, ask for sharing
Achievement oriented behavior	Challenges followers to produce the best possible outcome	Challenging, giving task, awarding

Leadership Behaviors demonstrated in Online Programming Communities

There are four leadership behaviors that are identified from the moderators' posts;

Directive Leadership Behavior:

Moderators with directive leadership behavior will enforce rules and guide other members to abide by the rules and regulation of the online community. They will take firm actions such as reprimanding or removing members who do not obey the regulations. Examples of directive leadership behavior are as follows:

> *"Soliciting illegal hacking is grounds for removal and I will delete any posts that reference it. It is against the rules"* ***(OC1M3).***
>
> *"If you continue in this manner you will be blocked from posting without further warning."* ***(OC2M4)***
>
> *"If you haven't already, please make sure that you have read our group rules (the Code of conduct). By participating in this group, you have to follow these community guidelines."* ***(OC3M1).***
>
> *"Posts about hacking will get the users banned *immediately* with no warning. People who try to help with hacking will get banned as well. Please report such posts with the "Report to admin" button."* ***(OC2M2).***
>
> *"Raihan Kabir, Your comment is removed. You have to use only English here."* ***(OC2M5).***

"Do not post/spam and unrelated stuff, even as a long-term member - looking @ Pablo" ***(OC4M2)***

"Mod note posts with screenshots and code in facebook will be removed. Please use github or b_paste. Help us help you better" ***(OC5M3).***

"*Please don't offer help if OP didn't even try or the question doesn't make much sense"* ***(OC1M4)***

Supportive Leadership Behavior

Leaders with supportive leadership behavior tend to welcome members to the community and give them positive feedback on their participation and contributions. These leaders motivate, inspire and support members who are facing difficulties in coding and handling projects. Examples of supportive moderators in online programming communities are as follows:

Hi developers,
welcome to our group called Javascript (NOT Java). You are welcome to share links with us, which are related to Javascript and types of it. If you have any problems with your example code, you can post the link here ***(OC4M1).***

*"Congratulations to All New Moderators! Nice to see how the PHP Group is growing! Congratz to [FB ID], [FB ID], [FB ID] and [FB ID]! ☺".****(OC2M3)***

"……. The whole PHP Group Staff wishes you a happy Programmers Day!. You're the heart and soul of this group and tons of Websites. Keep on being awesome!" ***(OC2M4)***

"*Warm welcome to 361 new members"* ***(OC3M1).***

Looks like we are now one of the largest Java groups on Facebook! Thanks to all of our members for making this group so awesome! ***(OC4M2)***

I thanks every developers who still helping new coming developers and designers. Big thanks goes to Chad Trikyas Mooney, Flavio Romairone, Farish Fathuhulla and other contributors that I missed to call their name here ***(OC5M2)***

"Hi, welcome to our lovely group of Web Developers, I'm Chris, Moderator of this group. To get started, here's the Code of conduct with our rules: [WEBSITE LINKS].
If you have any questions, go ahead and ask! ***(OC2M1).***

Welcome to the Web Design Group! ★★★★★ GROUP PURPOSE
★★★★★ This group is an interactive Html/Css group that can help you with learning how to code if you are a newcomer but can also help veterans to... ***(OC5M1)***

"for those who get really "emotional" for not learning the basics "fast", post less code more! Here's great starting point. [website links]" ***(OC1M1).***

"Stay motivated. Stay focused. Master the core concepts first. Have a nice day ☺" ***(OC1M4).***

Hello Developers,
you all need some patience to become a developer .When you are ready to work hard, you will become a good programmer. All you need guys design skills and programming skills. Keep moving forward ***(OC5M3)***

[SCREENSHOT SIMPLE CODE MADE BY NEW MEMBER]
Moderator comment: *"Good one! You can further improve it though. For instance: Since you've calculated area, on your 'first if', you can just do : print (area). Keep up!"* ***(OC1M1).***

"Chris chung, Here is a shout out to you man, here is why you gotta just stick with it and keep trying. Don't Give Up!!!!" You will get better!
Hit me up Chris, anytime! I'll Help you out!" ***(OC1M2)***

*"Show us your code and tell use your problem, We are here to help you!".****(OC2M2).***

"As I have noticed , there are many questions about GUIS recently like "which is the best gui". Over the next coming weeks, I will try to help with an overview with examples…… I will add my own examples as well as I will add some links to documentation to help get you started." ***(OC4M5)***

Achievement-Oriented Leadership Behavior

Achievement-oriented leadership provides a sense of purpose for other members. These moderators challenge followers to perform well and tend to create an achievement-oriented culture to get the best outcome from them. This is also done to assess the

members' potential in becoming better developers. Examples of this leadership behavior are as follows:

> *"Here is a fun challenge. Print a list of users with information about them you have to use at least one class and you can add or delete users and show current users through the admin class."* ***(OC1M3)***
>
> *"I really liked the idea of challenges for self-development with hands on experience! So here's mine ☺."* ***(OC2M3)***
>
> *"#mini_Challenge. Create a list of squares from 0-50, take that list and make a new one using its digits to create a list of doubles……. (maximum 2 lines no semicolons)* ***(OC3M3).***
>
> ***[ATTACHED INSTRUCTION & CROWD-SOURCED CODE MENTORSHIP]***
> *"Lets do some practice: How would you render and unordered list with javascript ? make an JQuery example and post your implementations as a jsfiddle (https://jsfiddie.net)"* ***(OC2M3).***
>
> *My challenge is to build an email client that allows the user to day to day tasks it must have a gui.* ***(OC3M1)***
>
> *BEGINNER CHALLENGE.*
> *String of numbers to list of numbers.*
> *Write a function that converts a string containing an ordered sequence of positive whole numbers and number ranges to an ordered list of those numbers, that it returns.* ***(OC3M2)***
>
> *Ready set GO!, Who can solve this fun algorithm & explain the process step by step ?. These are the type interview questions im preparing for so I nail my own interview…..* ***(OC4M4)***
>
> *I have group challenge:To help you guys:*
> *create one of the following:*
> *A calculator*
> *A webform that prints out the information*
> *A portfolio page:*
> *These are great projects to start your journey* ***(OC5M1)***
>
> *Yet Another C++ Programming Challenge! (Pascal Triangle) Write a program that shows the pascal triangle according to the rows given by the user……..* ***(OC5M2)***

""""" challenge""""""""" genius programmers"""""". Write a program that find 5! (factorial)? Program must be written in c++. 99% failed ***(OC5M3).***

Participative Leadership Behavior

Participative leaders encourage other members to contribute their perspectives, consult leaders when making decisions, and involve the members in the decision-making process. Followers' opinions are always taken into account to create a better environment. Some of the examples are:

"I would like to do a document on tkinter for the group, and a poll about favorite GUI doc frameworks and library, anyone like to join? " ***(OC1M2)***

Why don't we nominate a day of the week to show our projects? This way we encourage each other and constructively do better. We can call it.. #SolutionSaturday. Or maybe #MethodMondays. What do you guys think? ***(OC4M1)***

[quick poll] "*Please give us some feedback how many funny images/memes are OK for your point of view, and where are the limits. Thanks so much for participating. Gathered data will help admins and moderator manage the group better in the future. We'll do our best to fill the missing gaps. Cheers"* ***(OC3M2)***

Community discussion :
How do you validate your Login Session/Cookies to prevent Session Hijacking?
[Poll]
** Hashed Values*
**Split Token*
** Etcetera……* ***(OC3M2)***

"*Please share any ideas for improving the group, any constructive criticisms are also welcomed****" (OC2M4)***

Let's share your best C# answers / questions in this post, so others can probably profit from it. ***(OC4M3)***

4.9.2 Items Selection

This study adopts the measurement items from previously validated constructs, as suggested by Straub (1989). An advantage of using this approach is that the validity and reliability of the measurements have been confirmed, ensuring their quality (Blumberg, Cooper, & Schindler, 2014). The items are carefully selected to answer the research questions and are validated using a pilot study. It is important to note that the items are semantically constructed to fit the objective of this research. There are seven constructs measured using multiple items. The number of items for each construct are as follows; self-efficacy construct (5 items), outcome expectancy construct (7 items), the moderating effect of leadership behavior construct of supportive leadership (5 items), participative leadership (3 items), achievement-oriented leadership (3 items), directive leadership (3 items) and knowledge sharing behaviors construct (4 items). All items were measured using a five-point Likert scale which ranged from "strongly disagree" (1) to "strongly agree" (5). Table 4.3 lists the measurement constructs used in this study.

Table 4-3 :
Measurement constructs

	Construct	Items	Coding	Reference
1	Self-Efficacy	I am confident in responding to other members post in this Online Programming Community.	SE1	(Kankanhalli et al., 2005)
		The knowledge I share with members of this Online Programming Community should be useful to them.	SE2	(Kankanhalli et al., 2005)
		I am confident in giving guidance to questions asked by members of this Online Programming Community.	SE3	(Bock & Kim, 2001)

		I am confident that my knowledge sharing would help this Online Programming Community to achieve its goals.	SE4	(Bock & Kim, 2001)
		I am confident in providing my opinion to others by engaging in dialogue with other members in this Online Programming Community.	SE5	(Bock & Kim, 2001)
2.	Outcome Expectancy	My knowledge sharing will strengthen the tie between me and other members in this Online Programming Community.	OE1	(Compeau et al., 1999)
		Sharing my knowledge can enhance my reputation in this Online Programming Community.	OE2	(Compeau et al., 1999)
		Gaining useful information from this Online Programming Community will help me spend less time on routine job tasks.	OE3	(Compeau et al., 1999)
		Sharing my knowledge will give me a sense of accomplishment.	OE4	(Compeau et al., 1999)
		If I share my knowledge with other Online Programming Community members, I will get better cooperation and benefits in return.	OE5	(Carton & Lucas, 2018)
		Sharing my knowledge will help me meet other people with similar interests in this Online Programming Community.	OE6	(Carton & Lucas, 2018)
		Using knowledge from this Online Programming Community will	OE7	

		enable me to accomplish my tasks more efficiently.		(Carton & Lucas, 2018)
3.	Supportive Leadership Behavior	The most influential members help me find meaning of my existences in this Online Programming Community.	SB1	(Northouse, 2016)
		The most influential members keen to satisfy my inquiries posted in this Online Programming Community.	SB2	(Northouse, 2016)
		The most influential members give positive feedback when I contribute to this Online Programming Community.	SB3	(Northouse, 2016)
		The most influential members of this Online Programming Community encourage me when I needed support .	SB4	(Dong, 2012)
		The most influential members provide a clear vision of my existence in this Online Programming Community.	SB5	(Youcheng, 2003)
4.	Directive Leadership Behavior	The most influential members let me know what is expected from me in this Online Programming Community.	DB1	(Indvik, 1986; Northouse, 2016)
		The most influential members inform me the standard rules and regulations that I have to follow in online programming community	DB2	(Indvik, 1986; Northouse, 2016)
		The most influential members explain how I can contribute to this Online Programming Community.	DB3	(Indvik, 1986; Northouse, 2016)

5.	Participative Leadership Behavior	The most influential members listen receptively to my ideas and suggestions.	PB1	(Indvik, 1986; Northouse, 2016)
		The most influential members consult me when I share my ideas in this Online Programming Community.	PB2	(Indvik, 1986; Northouse, 2016)
		The most influential members always ask for my suggestions concerning on how to enhance community contribution in this Online Programming Community.	PB3	(Indvik, 1986; Northouse, 2016)
		The most influential members will let me participate in making decisions on enhancing this Online Programming Community.	PB4	(Indvik, 1986; Northouse, 2016)
6.	Achievement Oriented Leadership Behavior	The most influential members made me aware that participation in this Online Programming Community is beneficial and rewarding.	AOB1	(Indvik, 1986; Northouse, 2016)
		The most influential members set challenging goals for my contribution in this Online Programming Community.	AOB2	(Indvik, 1986; Northouse, 2016)
		The most influential members encourage my continual contribution in this Online Programming Community.	AOB3	(Indvik, 1986; Northouse, 2016)
7.	Knowledge Sharing Behaviors	I share my knowledge with members of this Online Programming Community.	KSB1	(Cabrera et al., 2006)
		I make valuable information available to all other members in this Online Programming Community.	KSB2	Cabrera et al., 2006)

I often ask for advice and information in this Online Programming Community that can help me solve problems in my work.	KSB3	Cabrera et al., 2006)
I try to stay updated by exploring all the information available in this Online Programming Community.	KSB4	Cabrera et al., 2006)
I contribute my ideas by participating in one or more discussion in this Online Programming Community.	KSB5	Cabrera et al., 2006)
I help other members find solutions to their problems in this Online Programming Community.	KSB6	Cabrera et al., 2006)

4.9.3 Pilot Study

A pilot study is a small-scale study that collects data from respondents to analyse the items reliability before implementing the actual study (Saunders, 2011; Sreejesh, Mohapatra, & Anusree, 2014; Zikmund, Babin, Carr, & Griffin, 2013). Blumberg et al. (2014) stated that a pilot study helps researchers to identify the weaknesses in a study's design and instrumentation. In the same vein, questionnaires can be refined to aid respondents' understanding and consequently assist researchers in data recording (Saunders, 2011).

The process of gathering data during pilot study start by sending invitation thread through a web survey invitation to several online programming community (excluding the 20 online programming communities for real study), aiming to get as much respondents as possible to check the reliability of the instruments. In the invitation

thread, the researcher introduced himself and the reason why this pilot survey is conducted. The researcher also explained the importance of obtaining feedback from the respondents. In addition, a hyperlink was attached within the invitation thread to automatically link prospective participants to the Web survey page. Finally, participants were invited to comment on the Web survey. The results indicated that there are no major problems in understanding the Web survey instructions and items based on the comment on the web survey.

It should be noted that the collection phase procedure of pilot survey was similar to the real data. With regard to the sample size, there were 108 respondents who answered the web survey that was held from August to September 2017. Data extracted from these respondents used to check the reliability and validity of the instrument. Since the purpose of a pilot study is to test a study's reliability, the results were computed using Smart PLS 3.0 Software and are discussed below. The use of PLS in conducting the pilot study has also been incorporated in other studies (Kura, 2014).

The two most common approaches in evaluating reliability are Cronbach alpha and composite reliability and these approaches were used in this study. The minimum requirement for a confirmatory research is 0.60 and 0.70 respectively (Hair, Ringle, & Sarstedt, 2011). Furthermore, all of the items for the constructs satisfied the items loading requirement of 0.40 and above (Hair, Ringle & Sarstedt, 2013). The result is depicted in Table 4.4 below.

Table 4-4:
Reliability Analysis: Pilot Study

Variables	No. of Items	Cronbach's Alpha	Composite Reliability
Achievement Oriented Behavior	3	0.758	0.861
Directive Behaviour	3	0.809	0.886
Knowledge Sharing	6	0.856	0.894
Outcome Expectancy	7	0.727	0.809
Participative Behaviour	3	0.873	0.913
Self-Efficacy	5	0.753	0.837
Supportive behaviour	5	0.856	0.897

Hair et al. (2011) views will corroborated that the seven constructs achieved an acceptable level of internal consistency reliability. This implies that the measures used in the research instrument are reliable.

In addition, the measures were also subjected to convergent and discriminant validity. For convergent validity Average Variance Extracted (AVE) was computed. For discriminant validity, Fornell and Lacker (1981) criterion for assessing discriminant validity was followed. The criterion required that the square-root of AVE of each latent construct in the research model should be higher than its correlation with any other construct (Fornell & Larcker, 1981). The results of convergent and discriminant validity are contained in Table 4.5 below.

Table 4-5 ***:*** *Convergent and Discriminant validity*

Variables	Discriminant Validity							Convergent Validity
	AOB	**DB**	**KSB**	**OE**	**PB**	**SE**	**SB**	**AVE**
Achievement Oriented	**0.821**							0.674
Directive Behaviour	0.763	**0.849**						0.721
Knowledge Sharing	0.522	0.66	**0.767**					0.588
Outcome Expectancy	0.583	0.522	0.543	**0.615**				0.485
Participative Behaviour	0.78	0.671	0.528	0.506	**0.852**			0.725
Self-Efficacy	0.441	0.615	0.675	0.48	0.417	**0.721**		0.519
Supportive behaviour	0.788	0.8	0.608	0.605	0.828	0.544	**0.797**	0.635

The result in Table 4.5 above indicated that the constructs have achieved an acceptable level of convergent validity and discriminant validity. The result depicts strong level of discriminant validity among the latent constructs. It is evident that the square-root of AVE of each of the seven latent constructs are higher than its correlation with any other latent construct in the research model (Fornell & Larcker, 1981; Hair, et al., 2011). Therefore, the overall results of the pilot study showed that the measures are reliable and valid for the main survey in this study.

4.10 Data Analysis

After the data collection stage, statistical techniques were employed for data analysis using SPSS. The techniques such as the reliability test and SEM are introduced in the following sections.

4.10.1 Descriptive Statistics

Descriptive statistics is used to collect, summarize, and present data (Ghauri & Gronhaugh, 2010). With the use of IBM ® SPSS ® Version 21, demographic data of the real study were summarized and presented numerically using frequency table to present categorical data (Pallant, 2013). The range of the measurement items in the Likert scale were also computed and presented

4.10.2 Reliability Test

Reliability test examines the reliability of a scale. Pallant (2013) mentioned that the internal consistency is crucial in a quantitative study. It was observed that the Cronbach's alpha value is the most reliable method in checking the reliability of a contemporary social science research. Hinton, McMurray, and Brownlow (2004) indicate that a reliable scale between 0.5 to 0.7 shows a moderate reliability and the scale between 0.7 to 0.9 indicate a high reliability. Apart from that, Pallant (2013) and

Zikmund et al. (2013) stated that a scale is reliable if the Cronbach's alpha is greater than 0.6.

4.10.3 Structural Equation Modeling

Structural Equation Modeling (SEM) is a sophisticated technique used to examine the inter-relationships among a set of variables in a complex model (i.e. a model with one or more independent variables or a model with one or more dependent variables) (Ghauri & Gronhaugh, 2010; Pallant, 2013; Polonsky & Waller, 2014; Tharenou, Donohue, & Cooper, 2007). Furthermore, Pallant (2013) states that SEM combines the techniques used in multiple regression and factor analysis. There are two key components in SEM; measurement (factor) model and structural regression model (Ghauri & Gronhaugh, 2010; Tharenou et al., 2007). With SEM, both direct effect and indirect (mediating and moderating) effect can be tested (Polonsky & Waller, 2014; Tharenou et al., 2007). In addition, Polonsky and Waller (2014) and Tharenou et al. (2007) outlined the criterion to be fulfilled if one is to use SEM: (1) there are sufficient previous studies and theories on the relationships of the model and (2) the model has 20 or fewer latent constructs. In this study, the research framework is composed of several independent variables and one dependent variable. All of the relationships were hypothesized with sufficient literature support. The total number of constructs was also less than 20; there were 7 constructs. Therefore, SEM can be employed to examine the inter-relationships in the research model.

4.10.3.1 Covariance-Based SEM (CB-SEM) or Partial Least Squares (PLS SEM)

Comparing the statistical methods can help in the selection of the best method for this study. There are few factors to be considered such as the objectives of the research, the modeling of the structural model, the types of measurement model specification, the

data characteristics, and the model evaluation (Hair, Ringle, & Sarstedt, 2011). Earlier literature has suggested four guidelines in choosing between PLS-SEM and CB-SEM.

Firstly, the researcher needs to recognize the objective of the research. The CB-SEM method is used to demonstrate if a theoretical model fits the observed data and if it is suitable to be used to confirm the theory (Barclay, Higgins, & Thompson, 1995). Meanwhile, PLS-SEM aims to maximize the amount of covariance between LVs to increase the model interpretation. This method is suitable for researches that focus on theory development (Sosik, Kahai, & Piovoso, 2009).

Secondly, CB-SEM can only be employed to research models that use reflective constructs. On the other hand, PLS-SEM enables researchers to use either reflective, formative or the mixture of both constructs (Urbach & Ahlemann, 2010).

Thirdly, CB-SEM has its own list of requirements before it is to be employed. The assessment are: 1) data multivariate normality, 2) observation independence, and 3) variable metric uniformity (Sosik et al., 2009). In addition, CB-SEM requires a large sample size with a normal distribution. If this criterion is not fulfilled, the results will be highly inaccurate (Hair et al., 2011). In contrast, PLS-SEM has a more robust approach as it can be used to analyze data with non-normality distribution. This model does not require data with a normal distribution as it can calibrate any non-normal data according to the central limit theorem (Sosik et al., 2009).

Finally, in terms of structural model evaluation, PLS mainly test/predict the theoretical models that have been suggested by previous models and disregard alternative models (Sosik et al., 2009). This approach tends to estimate the theories based on the correlation between the residuals on manifest and latent variables (Hair et al., 2011). Table 4.6 summarizes the criterion for selecting between CB-SEM and PLS-SEM.

Table 4-6 :
Summary of evaluation criteria for selecting between CB-SEM and PLS-SEM

	Criteria to evaluate	CB-SEM	PLS-SEM
1	**Research Goal**		
	i. Predicting key target constructs		✓
	ii. Theory testing, theory confirmation or comparison of alternative theories.	✓	
	iii. Exploratory of an extension of an existing structural theory.		✓
2	**Measurement model specification**		
	i. If formative constructs are part of the structural model		✓
	ii. If error terms require additional specification such as co-variation	✓	
3	**Structural Model**		
	i. If a structural model is complex		✓
	ii. If a structural model is non-recursive	✓	
4	**Data characteristics and algorithm**		
	i. Data meet distributional assumptions	✓	
	ii. Data did not meet distributional assumptions		✓
	iii. Small sample size consideration	✓	✓
	iv. Large sample size consideration		✓
	v. Non-normal distribution	✓	✓
	vi. Normal distribution		
5	**Model evaluation**		
	i. Use latent variable scores in subsequent analysis	✓	✓
	ii. Requires global goodness of fit criterion	✓	
	iii. Need to test for measurement model invariance		

This research incorporated the PLS-SEM as the statistical method to evaluate the research model because:

1. The current study aims to predict the moderating role of virtual leadership behaviors. At the same time, we are testing a new theory; the relationship between personal cognitive attributes and knowledge sharing. These characteristics classify this research as an exploratory study.

2. The goal of this study does not include the analysis of the model invariance but on the prediction factors related to knowledge sharing behavior. Therefore, the use of latent variable (LVs) scores is important to examine the underlying relationship between the LVs.
3. This study is based on prior theoretical knowledge. The PLS-SEM has the ability to estimate the correlations between the residuals and assess their impacts.
4. The integration of four leadership behaviors as a moderator complexed the structural model of this research, making it more preferable to use PLS-SEM.
5. The data of this study is not normally distributed. This is based on the normality analysis during the data cleaning procedure. Consequently, this calls for the use of PLS-SEM (Hair Jr et al., 2016).

4.10.3.2 Partial Least Square (PLS)

Partial Least Square (PLS) was created by Herman Wold, an econometrician in the 70's. (Chin, 1998). The PLS is an extended principal component and canonical correlation analysis originated from a family of alternating least squares algorithms (Henseler, Ringle, & Sinkovics, 2009). Two sets of linear equations – measurement and structural models – are used to define the PLS path models (Henseler et al., 2009). In addition, the measurement model specifies the relationships between unobserved or latent variables (LV) while the structural model specifies the relationships between LV and its manifest variables.

Furthermore, the PLS algorithm is essentially a sequence of regressions in terms of weight vectors (Henseler et al., 2009). The basis of the PLS algorithm involves the following stages:

1. Stage 1: Iterative estimation of LV scores. This involves a four-step iterative procedure that is repeated until a convergence is obtained:
    a. Outer approximation of the LV scores,
    b. Estimation of inner weights,
    c. Inner approximation of the LV scores, and
    d. Estimation of the outer weights.
2. Stage 2: Estimation of outer weights/loading and path coefficients.
3. Stage 3: Estimation of location parameters.

4.10.3.2.1 Evaluating Measurement and Structural Models using Partial Least Square

In this study, the research model is evaluated using a two-step process: 1) the evaluation of the measurement model and 2) the evaluation of the structural model. The model validation is executed to determine whether the quality for empirical work is satisfied by both models (Urbach & Ahlemann, 2010). The next subsections discuss the guidelines used in this study to evaluate the measurement and the structural models of this study.

Measurement Model

Previous studies show that the validation of a reflective measurement model can be formed by testing its internal consistency, indicator reliability, convergent validity, and discriminant validity (Lewis, Templeton, & Byrd, 2005; Straub, Boudreau, & Gefen, 2004). The summary of the validity guidelines is depicted in Table 4.7.

Table 4-7 :
Validity Guidelines for Assessing Reflective Measurement Model

	Validity Type	Criterion	Guidelines
1	Internal Consistency	CR	CR > 0.7 (for exploratory study) CR > 0.8 (advance research) CR < 0.6 – lack of reliability
2	Indicator reliability	Indicator Loadings	Items' loading > 0.4
3	Convergent validity	AVE	AVE > 0.50
4	Discriminant validity	Cross loading	Item's loading of each indicator is highest for its designated construct.
		Fornel and Larcker	The square root of the AVE of a construct should be greater than the correlations between the construct and other constructs in the mode.

With regard to the previous discussions, the measurement model's validity is satisfactory when:

1. CR is greater than 0.8.
2. Item's loading is greater than 0.4.
3. AVE value for each construct is larger than 0.50.
4. Item's loading of each indicator is highest for its designated construct.
5. The square root of the AVE of a construct is greater than the correlations between the construct and other constructs in the model.

Structural Model

Moving on, validating the structural model can assist the researcher to systematically evaluate if the data support the hypotheses expressed by the structural model (Urbach & Ahlemann, 2010). In addition, the structural model can only be analyzed after the

measurement model has been successfully validated. In PLS, a structural model can be evaluated using the coefficient of determination (R2) and path coefficients.

An important criterion in assessing the PLS structural model is an evaluation of each endogenous LV's coefficient of determination (R2). R2 measures the relationship of an LV's explained variance to its total variance. According to Chin (1998), a value of R2 around 0.67 is considered substantial, values around 0.333 are average, and values of 0.19 and lower are considered weak.

By examining the path coefficient value, researchers can determine the strength of the relationship between two LVs. Apart from that, to examine the relationship between two LVs, a researcher should check the path coefficients, algebraic sign, magnitude, and significance between the two LVs. According to Urbach and Ahlemann (2010), the path coefficients should exceed 0.100 to account for a certain impact within the model and should have at least 0.05 significance value. Table 4.8 summarizes the guidelines to validate the structural model.

Table 4-8 :
Summaries of Validity Guidelines for Assessing Reflective Structural Model

	Validity Type	Criterion	Guidelines
1	Model Validity	Coefficient of Determination (R^2)	0.67 – Substantial 0.333 – moderate 0.190 – weak
2		Path-Coefficients	Path coefficient must be at least 0.100 and at significance (at least 0.05)

Based on previous discussions, the structural model will be evaluated based on the following characteristics:

1. The coefficient of determination must be larger than 0.19.

2. Path coefficient between LVs must be at least 0.1, follow the correct algebraic sign (in the case of this study positive), and significant (at least 0.05).

4.10.4 Moderating Effect Analysis

According to Hair, Ringle, and Sarstedt (2013), when the effect of an exogenous variable on an endogenous variable is hooked on the values of another variable, there is the presence of moderating effect. This is when such variable moderates the nexus between the two variables (i.e. exogenous and endogenous variables). In addition, Baron and Kenny (1986) state that a moderating variable is a qualitative or quantitative variable that affects the direction or the strength of the relationship between the exogenous variable and the endogenous variable (Baron and Kenny, 1986). Furthermore, Holmbeck (1997) explained that a moderator demonstrates the strength differences of the relationship between an exogenous variable and endogenous variable, as shown in Figure 4.2. Moreover, the moderating variable is useful in simplifying the variations in the stands of researchers (Chin et al., 2003; Homburg & Giering, 2001). Therefore, a moderator is worth introducing when there are diverse opinions on the relationship between the exogenous and endogenous variables (Baron and Kenny, 1986).

$$\text{Effect Size of Moderator } (F^2) = \frac{R^2 \text{ model with moderator} - R^2 \text{ model without moderator}}{1 - R^2 \text{ model with moderator}}$$

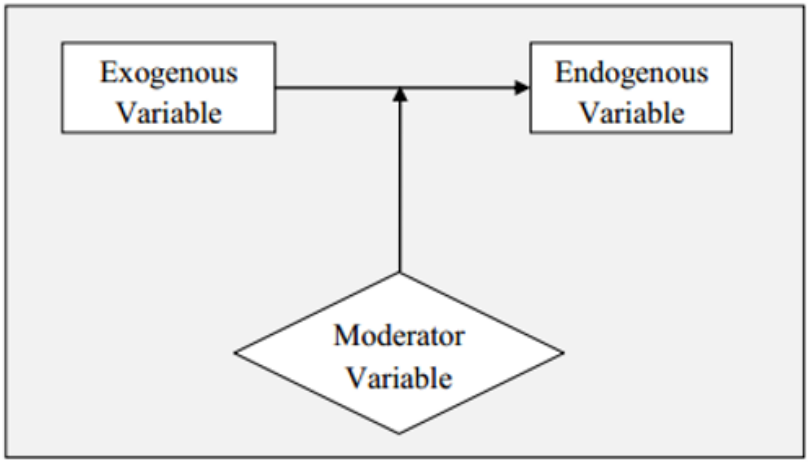


Figure 4.2. Illustration of Moderator Variable

Furthermore, the moderating effect in a reflective model can be tested using product term approach and group comparisons approach (Henseler & Fassott, 2010). The product term approach is constructed between the indicators of the latent exogenous variable and the indicators of the latent moderator variable (Henseler & Fassott, 2010; Chin et al., 1996, 2003). This approach is useful when the interactive variables are continuous. There are three fundamental steps in assessing the moderating effect (Henseler & Fassott, 2010) as shown in Figure 4.3.

i. Estimation of the influence of exogenous variable on endogenous variable (path a).

ii. The direct impact of the moderating variable on the endogenous variable (path b).

iii. The confirmation of the significance of interaction between exogenous and moderation variables on the endogenous variable (path c).

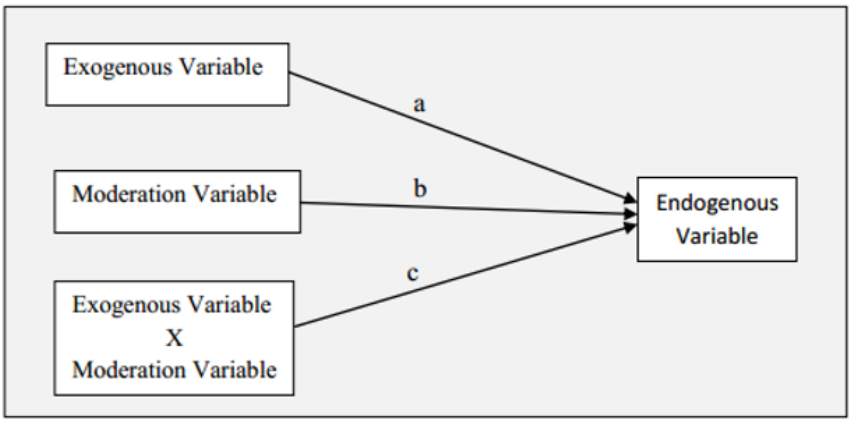


Figure 4.3. Steps in Moderation Assessment
Source: Baron & Kenny (1986)

4.11 Chapter Summary

All in all, this chapter provides an insight into the researcher's philosophical stance, research process, research design, research approach, sampling method, and instrument for collecting and analyzing the data employed in this research. Furthermore, it discusses the processes of validating the instrument, data collection, and data analysis techniques. The measurement issues are also identified and PLS-SEM is introduced as a data analysis technique. In addition, the approaches used to develop the research instrument are also explained in this chapter. This study incorporates the use of a pilot survey to validate the survey. Apart from that, the format and administration of the Web survey and the preliminary details of the actual survey are also discussed. We will be discussing the results of data analysis in the next chapter.

CHAPTER 5 :

DATA ANALYSIS AND RESULTS

5.1 Introduction

In this chapter, data analysis and the results were presented. The data analysis involved descriptive analysis and inferential analysis via SPSS version 21 and Smart PLS 3.0 M3 software respectively. Hence, this section of the study has two parts: initial data screening and preliminary analysis and inferential analysis. The initial data screening and preliminary analysis entails data entry, missing value analysis, assessment of outliers, normality test, multicollinearity test, test for non-response bias, and common method bias/variance test.

Equally, the inferential analysis involves confirmation of second order constructs of the study and measurement model, which was done to determine the constructs' reliability, internal consistency reliability, convergent validity, and discriminant validity. It also includes structural model (i.e., significance of the path coefficients, level of the R-squared values, effect size, and predictive relevance of the model) and complementary PLS-SEM analysis involving testing of the moderating effects in the structural model. The chapter was wrapped up with the summary of hypotheses results.

5.2 Response Rate

The data collection in this research was conducted for four months from 15 October 2017 to 15 January 2018. The invitation threads are posted in the online community lounge and walls. Within the invitation thread, respondents are briefed about the

purpose of the study and given a link to the Web survey. The completion time for the Web survey ranged an average of 8 minutes.

Out of the 350 responses, 17 responses are invalid because these respondents informed they did not join any online programming community.

Table 5-1: Response Rate of the Questionnaires

Response	**Frequency**
Collected survey	350
Usable survey	333

After the preliminary scrutiny, all 333 usable cases are loaded into SPSS version 21 software for the following reasons:

1. Generating descriptive statistical reports,
2. Generating exploratory analyses on every variable to check for missing or invalid data, and
3. Generating additional analyses to check for normality test, response biasness, multicollinearity and common method biasness.

5.3 Data Screening and Preliminary Analysis

Through preliminary data screening, possible breach of vital assumptions about the application of multivariate techniques of data analysis can be easily detected. Hence, preliminary analysis is crucial in any multivariate analysis (Hair, 2007).

In this study, the first step of preliminary data screening was inputting the returned and usable questionnaires via SPSS. Following preliminary data screening, preliminary data

analysis was carried out. This involves missing value analysis, assessment of outliers, normality test, and multicollinearity test (Joseph, Hair, Black, Babin, & Anderson, 2010; Tabachnick & Fidell, 2007).

5.4 Missing Value Analysis

In SEM analysis, replacement of missing values cannot be overemphasized, because the available tools and techniques cannot function with missing values in the data set (Lomax & Schumacker, 2004). Also, the quality of data analysis is largely contingent on the correctness of data organization and its further conversion into a form appropriate for analysis (Kristensen & Eskildsen, 2010). Moreover, it is observed in the data set that certain cases have missing values; self-efficacy (SE) had 2 missing values, outcome expectancy (OE) had 6 missing values, social leadership behavior (SB) had 5 missing values, and knowledge sharing behavior (KSB) had 3 missing values.

The overall missing data were 0.151 per cent, and it is less than 5 per cent (see Table 5.2), and thus deemed as non-significant. Given the position of Schafer (1999) and Tabachnick and Fidell (2007) which indicates that missing rate of 5 per cent or less is non-significant, no item or case was deleted, and the missing values were replaced using mean substitution (Joseph et al., 2010).

Table 5-2 : Total and Percentage of Missing Values

Constructs	Number of Missing Values
Self-Efficacy (SE)	2
Outcome Expectancy (OE)	6
Supportive Leadership Behavior (SB)	5
Knowledge Sharing Behavior (KSB)	3
Total	15 (out of 10, 626 data points)
Percentage	0.151%

5.5 Evaluation of Outliers

In a dataset, there can be some observations or a subset of observations which seems to be irregular. Such seemingly irregular observations are called outlier (Barnett & Lewis, 1994). Joseph et al. (2010) described outliers as the values that have unusual attributes and differ totally from other values. This signifies that outliers are out-of-range values in a given dataset. Given this fact, it is held that the presence of irregular observations in the dataset, which is meant for regression analysis, can adversely affect the estimates of regression coefficients and consequently render the results inaccurate (Verardi & Croux, 2008).

In this study, efforts to detect outliers involves some steps. The first step was calculation of frequency via SPSS in which frequency was generated. The frequency table showed that some observation are found to be out of normal range. In addition, standardized values with a cut-off of ±3.29 ($p < .001$) was calculated, as suggested by Tabachnick and Fidell (2007), in order to spot any univariate out-of-range value in the dataset. Based Tabachnick and Fidell (2007) standard, an analysis for the identification of univariate outliers through SPSS revealed 11 univariate outliers in the dataset as shown in Table 5.3.

Table 5-3: Univariate Outliers

Constructs	**Number of Cases**
Self-Efficacy (SE)	3
Outcome Expectancy (OE)	2
Supportive Leadership Behavior (SB)	1
Directive Leadership Behavior (DB)	2
Knowledge Sharing Behavior (KSB)	3
Total	11

Concerning the treatment of univariate outliers, all the 11 cases that exceeded that standardized value of ±3.29 ($p < .001$) were deleted, leaving the study with 322 cases in the dataset. Failure to delete the outliers has the tendency of adverse effect statistical accuracy of estimates.

Moreover, other aspect of outliers is multivariate outliers. Mahalanobis distance (D2) with a threshold of chi-square is 20.52 ($p = 0.001$) is normally used to spot this kind of outliers. Based on the threshold, none of the values in the data was found to be multivariate outliers. So far, no outlier was found in the entire dataset. Hence, no observation or a set of observations were deleted.

5.6 Normality Test

Although it was held in some past studies, which include Reinartz, Haenlein, and Henseler (2009), Wetzels, Odekerken-Schröder, and Van Oppen (2009) and host of others, that PLS-SEM offers precise model estimations in situations with tremendously non-normal data, it has been also recommended by Hair, Sarstedt, Ringle, and Mena (2012) that normality test of data should be conducted. In addition, in a situation where there is highly skewed or kurtotic data, there can be rise in the bootstrapped standard error estimates, and this will consequently miscalculate the statistical significance of the path coefficients (Dijkstra, 1983; Ringle, Sarstedt, & Straub, 2012).

Normal distribution is thought to have significant importance in various structural equation modelling and statistical tests (Hair et al., 2010; Hair, Black, Babin,Anderson, & Tathamir, 2006). According to Hair et al. (2006), normality improves the structure of the data distribution structure along with its correspondence to the normal distribution which is the statistical methods‘ benchmark. Hair et al. (2014) stated that

the normality of the data employed in the analysis can be estimated using Skewness and Kurtosis‘ values test. Skewness value provides information on the distribution‘s symmetry of responses for a variable. In other words, the distribution is called Skewness, when the responses of variable extended toward the left or right tail of the distribution, while Kurtosis indicates the distribution‘s peakedness. In other words, it is a measure to test whether the distribution is peaked. Both Kurtosis and Skewness Z-value have to be between +1.96 and -1.96 for the data to be considered perfectly normal (Henseler, Ringle, & Sarstedt, 2015; Kline, 2011). The normality of the data distribution was examined through Kurtosis and Skewness in this study. The entire items of the constructs were examined and the results of both Kurtosis and Skewness Z-value were either more than 1.96 or lower than -1.96, which indicates that the data is not normal. A sample of the results explaining the SE and OE factor is illustrated in Table 5.4. Since data is not normally distributed, the use of smartPLS for analysis as compared to CB-SEM is justified.

Table 5-4:

Skewness and Kurtosis for Self-Efficacy and Outcome Expectancy

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
SE1	322	3.92	0.877	-.645	.136	-.131	-.271
SE2	322	4.23	0.683	-.804	.136	1.555	-.271
SE3	322	3.90	0.937	-.847	.136	.371	-.271
SE4	322	3.94	0.826	-.830	.136	1.163	-.271
SE5	322	3.98	0.846	-.853	.136	.742	-.271
OE1	322	3.83	0.836	-.469	.136	-.061	-.271
OE2	322	3.92	0.983	-.452	.136	-.809	-.271

OE3	322	4.19	0.819	-1.013	.136	1.135	-.271
OE4	322	4.09	0.754	-1.090	.136	2.152	-.271
OE5	322	3.63	0.962	-.407	.136	-.341	-.271
OE6	322	3.89	0.956	-.772	.136	.132	-.271
OE7	322	4.25	0.780	-1.153	.136	1.854	-.271
Valid N (Listwise)	322						

A Shapiro-Wilk's test (p>.05) (Razali & Wah, 2011) showed that the value are less that the p value of most variables item are less than 0.005 were are not normally distributed as illustrated in table 5.5.

Table 5.5.
Shapiro-Wilk's test

	Kolmogorov-Smirnov[a]			**Shapiro-Wilk**		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
SE1	.271	322	.000	.852	322	.000
SE2	.280	322	.000	.773	322	.000
SE3	.298	322	.000	.834	322	.000
SE4	.294	322	.000	.829	322	.000
SE5	.304	322	.000	.821	322	.000
OE1	.278	322	.000	.857	322	.000
OE2	.215	322	.000	.852	322	.000
OE3	.250	322	.000	.799	322	.000
OE4	.291	322	.000	.772	322	.000
OE5	.243	322	.000	.887	322	.000
OE6	.278	322	.000	.847	322	.000
OE7	.251	322	.000	.774	322	.000
SB1	.175	322	.000	.912	322	.000

SB2	.257	322	.000	.877	322	.000
SB3	.260	322	.000	.878	322	.000
SB4	.256	322	.000	.879	322	.000
SB5	.197	322	.000	.906	322	.000
DB1	.234	322	.000	.888	322	.000
DB2	.263	322	.000	.881	322	.000
DB3	.257	322	.000	.884	322	.000
PB1	.240	322	.000	.877	322	.000
PB2	.208	322	.000	.902	322	.000
PB3	.163	322	.000	.913	322	.000
PB4	.205	322	.000	.903	322	.000
AOB1	.226	322	.000	.898	322	.000
AOB2	.177	322	.000	.913	322	.000
AOB3	.232	322	.000	.899	322	.000

Sig : p value

5.7 Multicollinearity Test

Multicollinearity refers to a condition in which high correlation exists between two or more exogenous latent constructs in a particular multiple regression model (Sekaran & Bougie, 2011). According to Tabachnick and Fidell (2007), existence of perfect correlation among exogenous latent constructs is the underlying assumption, but there shouldn't be multicollinearity among the constructs in the regression model, because it distorts the estimates of regression coefficients and their statistical significance tests (Chatterjee & Yilmaz, 1992; Hair, Black, Babin, Anderson, & Tatham, 2006). In addition, multicollinearity is unwanted in the regression model because it amplifies the

standard errors of the coefficients, which in turn render the coefficients statistically non-significant (Tabachnick & Fidell, 2007).

Two distinct techniques were adopted in this study to check for multicollinearity (Chatterjee & Yilmaz, 1992; Peng & Lai, 2012). The first technique involved vetting the correlation matrix of the exogenous latent constructs. Given the position of Sekaran and Bougie (2011), correlation values of 0.7 and above are considered high correlation. but Joseph et al. (2010) looked at it differently as they postulated that inter-correlation values of more than 0.9 is regarded high correlation. The outcome in Table 5.6 shows that the correlation matrix is of exogenous latent construct are below 0.9 ranging from 0.108 to 0.667.

Table 5-6: Correlation Matrix of the Exogenous Latent Constructs

	SE	**OE**	**SB**	**DB**	**PB**	**AOB**
SE	1					
OE	.313**	1				
SB	.121*	.511**	1			
DB	.179**	.407**	.629**	1		
PB	.224**	.426**	.667**	.495**	1	
AOB	0.108	.483**	.631**	.605**	.593**	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Note: SE = self-efficacy; OE = outcome expectancy; SB = supportive leadership behavior; DB = directive leadership behavior; PB = participative leadership behavior; AOB = Achievement-oriented leadership.

Besides, the second technique used to check for multicollinearity is by checking variance inflated factor (VIF) and tolerance value. Based on Joseph et al. (2010), VIF values of more than 10 and the tolerance value of less than .10, indicate that multicollinearity problem exists in such a model. However, in this study, the result presented in Table 5.7 shows that there is no multicollinearity problem in the model as all VIF values were less than 5, and tolerance values surpassed .20.

Table 5-7: Multicollinearity Test

Constructs	Tolerance	Variance Inflation Factor
SE	0.838	1.193
OE	0.583	1.716
SB	0.323	3.092
DB	0.444	2.253
PB	0.48	2.081
AOB	0.441	2.267

Note: SE = self-efficacy; OE = outcome expectancy; SB = supportive leadership behavior; DB = directive leadership behavior; PB = participative leadership behavior; AOB = Achievement-oriented leadership.

5.8 Non-Response Bias

Non-response bias denotes, according to Berg (2005), the common error which can stem from research's assessment of sample characteristics in which some respondents can be underrepresented as a result of non-response. As there is no minimum response rate below which a survey assessment is necessarily biased, so also there is no response rate above which it is never biased (Groves, 2006). In addition, it was opined by Pearl and Fairley (1985), and Sheikh and Mattingly (1981) that there is likelihood of detecting bias in the non-response rate irrespective of its size. For that reason, checking for non-response bias becomes imperative. In doing this, Armstrong and Overton (1977) extrapolation approach was adopted. This approach involves making

comparison between the early and late responses from the sampled respondents, and based on the argument of the two scholars, early responses are compared to late response.

Following the adopted approach, respondents of this survey were divided into two distinct groups based on their responses to the survey which connotes both the endogenous latent variable and the exogenous latent variables involving knowledge sharing behaviors, self-efficacy, outcome expectancy, supportive leadership behavior, participative leadership behavior, achievement-oriented leadership and directive leadership behavior.

The process of data collected began with the distribution of questionnaires to the respondents on October 2017 until January 2018, but some questionnaires were answered early while some were answered late. Thus, two groups of responses: early response and late response. Early responses represented the questionnaires that were answered on October and November while late responses involved the questionnaires which were answered on December and January. The two groups of responses were compared.

The results of independent-samples t-test, as shown by Table 5.8, indicated that the equal variance significance values for each of the variables of the study were greater than the 0.05 significance level of Levene's test for equality of variances, and going by the position of Pallant (2010) and Field (2009), the assumption of equal variances between early and late responses has not been violated. Therefore, it can be established that non-response bias was not a major concern in this study. This is also affirmed by the fact that this study achieved response rate, which is over and above what was

suggested by Lindner and Wingenbach (2002). Hence, the issue of non-response bias does not appear to be a major concern in this research.

Table 5-8: Results of Independent-Samples T-test for Non-Response Bias

Constr.	Group	N	Mean	Std. Deviation	Levene's Test for Equality of Variances	
					F	Sig.
SE	Early Response	194	4.3907	0.3655	7.735	0.211
	Late Response	128	3.3906	0.46676		
OE	Early Response	194	4.1267	0.50245	0.119	0.731
	Late Response	128	3.7857	0.46714		
SB	Early Response	194	3.5971	0.84722	5.399	0.421
	Late Response	128	3.3047	0.69592		
DB	Early Response	194	3.732	0.85795	0.107	0.743
	Late Response	128	3.4219	0.79421		
PB	Early Response	194	3.4897	0.90581	9.574	0.222
	Late Response	128	3.0781	0.75539		
AOB	Early Response	194	3.4399	0.93613	3.747	0.254
	Late Response	128	3.194	0.85823		
KSB	Early Response	194	4.1082	0.56375	0.328	0.567
	Late Response	128	3.5104	0.59369		

Note: SE = self-efficacy; OE = outcome expectancy; SB = supportive leadership behavior; DB = directive leadership behavior; PB = participative leadership behavior; AOB = Achievement-oriented leadership; KSB = knowledge sharing behavior.

5.9 Common Method Variance Test

Common method variance (CMV) denotes variance which occurs as a result of measurement method rather than the constructs of the study (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). CMV is referred to as mono-method bias. Scholars are

unanimous on the fact that common method variance has become a main concern for the researchers who adopt self-report surveys (Lindell & Whitney, 2001; Podsakoff et al., 2003; Spector, 2006). CMV can cause exaggerated relationships among the variables of the study (Conway & Lance, 2010).

To curtail CMV's effect, some steps were taken. Part of the steps taken was reduction of respondents' evaluation apprehension by telling them there is no right or wrong answer to the items in the survey, and that their answers will be treated with utmost confidentiality. In addition, there was an improvement on the scale items by using simple, specific, and concise language, and avoiding unclear terms.

Moreover, Harman's single factor test, which was proposed by Podsakoff and Organ (1986), was employed to examine common method variance. This was done by subjecting all the variables of the study to PLS measurement model analysis which covers the common exploratory factor analysis. This was done in order to ascertain the number of factors that are essential to account for the variance in the variables (Podsakoff & Organ, 1986). The output of the model analysis indicated that common method bias is not a major concern and there is no tendency that there would be high correlations among variables of this study.

5.10 Descriptive Statistics: Profile of the Respondents

As depicted in Table 5.9 below, this section presented demographic information about the respondents in online programming communities who responded to the research instruments used in this study. The emphasis was paid to gender, age, level of education, experience in using online programming communities and type of online

programming communities they are using. The result of this analysis is as shown in Table 5.9.

Table 5-9: Descriptive Analysis of Demographic Data

Gender	**Frequency**	**Percentage (%)**
Male	272	85%
Female	50	15%
Total	322	100%
Age	**Frequency**	**Percentage (%)**
13-20 Years	48	15%
21-30 Years	152	47.5%
31-40 Years	77	24.1%
41-50 Years	29	9.1%
51-60 Years	10	3.1%
Over 61 Years	4	1.3%
Total	322	100%
Education Level	**Frequency**	**Percentage (%)**
Primary School	9	2.8%
Secondary School	64	20%
Diploma	54	16.9%
Bachelor Degree	123	38.4%
Master Degree	53	16.6%
PhD	17	5.3%
Total	322	100%
Experience using OPC	**Frequency**	**Percentage (%)**
Less than 1 year	67	20.9%
1 to 3 years	139	43.4%
3 to 5 years	56	17.5%
5 to 7 years	22	6.9%
More than 7 years	36	11.3%
Total	322	100%
Visit OPC	**Frequency**	**Percentage (%)**
Everyday	116	36%

More than once a week	134	41.6%
More than once a month	52	16.1%
More than once a year	10	3.1%
Less than once a year	1	3%
Rarely	9	2.8%
Total	322	100%
Post OPC	**Frequency**	**Percentage (%)**
Everyday	16	5
More than once a week	56	17.4
More than once a month	85	26.4
More than once a year	54	16.8
Less than once a year	14	4.3
Rarely	73	22.7
Never	24	7.5
Total	322	100%
Ranking in OPC	**Frequency**	**Percentage (%)**
Beginner	78	24.2%
Intermediate	132	41%
Advanced	74	23%
Expert	22	6.8%
Moderator/ Administrator/ Community Manager	16	5%
Total	322	100%
OPC Category	**Frequency**	**Percentage (%)**
JavaScript	47	14.7%
SQL	9	2.8%
Java	21	6.6%
C#	22	6.9%
Python	64	20%
PHP	25	7.8%
C++	28	8.8%
C	11	3.4%

Ruby	2	0.6%
Swift	9	2.8%
VB.Net	7	2.2%
Assembly	2	0.6%
R	6	1.9%
Perl	10	3.1%
CSS	4	1.3%
Matlab	7	2.2%
Visual Basic	1	0.3%
Go	1	0.3%
Other OPC	44	13.8%
Total	322	100%

From Table 5.9 it can be seen that 85% of the respondents were male. The majority of age with 71.6% are from the age of 13-40 years old. The statistics also shows almost half of the participants hold bachelor degree. In terms of experience in using online programming communities, 43.4% of the respondent have joined between 1 to 3 years. In terms of the role in online programming communities, 29% regarded themselves as beginner level, 38% as intermediate level and the rest categorized into advanced level, expert level and moderator/community manager level. In sum, it can be fathomed from the above exposition that the respondents varied substantially in terms of their backgrounds, and this implies that the data used in the study was from the respondents of diverse demographic backgrounds, and thus enriching generalizability of the result of the research.

5.12 Partial Least Square (PLS) Structural Equation Modelling Approach

In addition to what had been explicated previously in the previous chapter, adoption of PLS-VBSEM for testing of hypotheses was borne out of the fact that PLS- VBSEM has been considered as prediction oriented (facilitating theory development). Although Covariance-Based SEM (e.g. AMOS, LISREL) approach has been widely adopted in the previous studies, presently considerable numbers of scholars have begun adopting PLS-VBSEM, given its advantages which include ability to estimate models which have got more variables than the observations when the focus is on theory development or prediction (Henseler, Fassott, Dijkstra, & Wilson, 2012); lack of factor indeterminacy or convergence issues (Henseler, 2010); relatively simpler distributional assumptions (Reinartz et al., 2009); and ability to measure formative constructs (Haenlein & Kaplan, 2004).

Apart from the fact that this study was poised to make prediction, this study's model contains independent and dependent variables and moderating variables. This rationalized the adoption of PLS-VBSEM using Smart PLS 3.0 software developed by Ringle, Wende, and Will (2005) to statistically explicate the relationship between the independent variables and dependent variable of the study, along with the moderating variable. Highly complex models with many latent and manifest variables can be estimated via PLS, because it can easily estimate hierarchical models, or moderating effects (Chin, Marcolin, & Newsted, 2003). PLS, as posited by Wold (1985), is suitably useful for complex models whereby the prominence shifts from individual variables and parameters to sets of variables and aggregate parameters. Also included as part of the PLS-SEM merits is the fact that, as mentioned by Ringle et al. (2012), PLS-SEM

enhance the already standing good reporting practices in disciplines such as information system, management, marketing etc.

Moreover, this study adopted a two-step process to estimate and report the results of PLS-SEM path, as recommended by Henseler et al. (2009). The adopted two-step process are assessment of a measurement model and assessment of a structural model. Measurement model is usually estimated via factor analysis while structural model is commonly estimated via path analysis (Lee, Petter, Fayard, & Robinson, 2011).

5.13 Measurement Model (Outer Model) Evaluation

Using Smart PLS, measurement model was examined, and it involved determination of individual item reliability, internal consistency, convergent validity and discriminant validity (Hair, Hult, Ringle, Sarstedt, & Thiele, 2017; Hair et al., 2011; Hair Jr et al., 2016; Henseler et al., 2009).

5.13.1 Item Reliability and Internal Consistency

The essence of item reliability and internal consistency, as described by Joseph et al. (2010), is to indicate the suitability and capability of items (i.e. indicators) spawned for a particular construct in measuring the main concept in a given research. Going by the position of Heise and George (1970) and Vinzi, Lauro, and Amato (2005), Principal Component Analysis (PCA) method is the method that should be adopted for measuring the basic factor structure of the items constituting a certain construct. PCA is embedded in Smart PLS and factor loadings were created for all items in it. Although it might have been theoretically proved in the literature review, it is basically required that all items must show highest loading values on their respective constructs than that on other constructs.

As depicted in Table 5.10 below, the indicators showed highest values on their respective constructs as compared to their loadings on other constructs. Likewise, the indicators entail significantly and acceptably high loadings, and thus affirming the content validity of the constructs involving knowledge sharing behaviors, self-efficacy, outcome expectancy, supportive leadership behavior, participative leadership behavior, achievement-oriented leadership, and directive leadership.

However, one indicator from outcome expectancy (OE2) fell below the threshold of 0.4 and it was deleted (Hair et al., 2011; Stevens, 1992; Stevens, 2012) and the other two items with the value of 0.541 and 0.596 respectively also were subsequently deleted because effecting the value of AVE, as suggested by Hair et al. (2011), outer loading between 0.40 and 0.70 should be considered for removal from the scale only when deleting the indicator leads to an increase in the AVE. The value of outcome expectancy AVE turned 0.510 after deleting these three items.

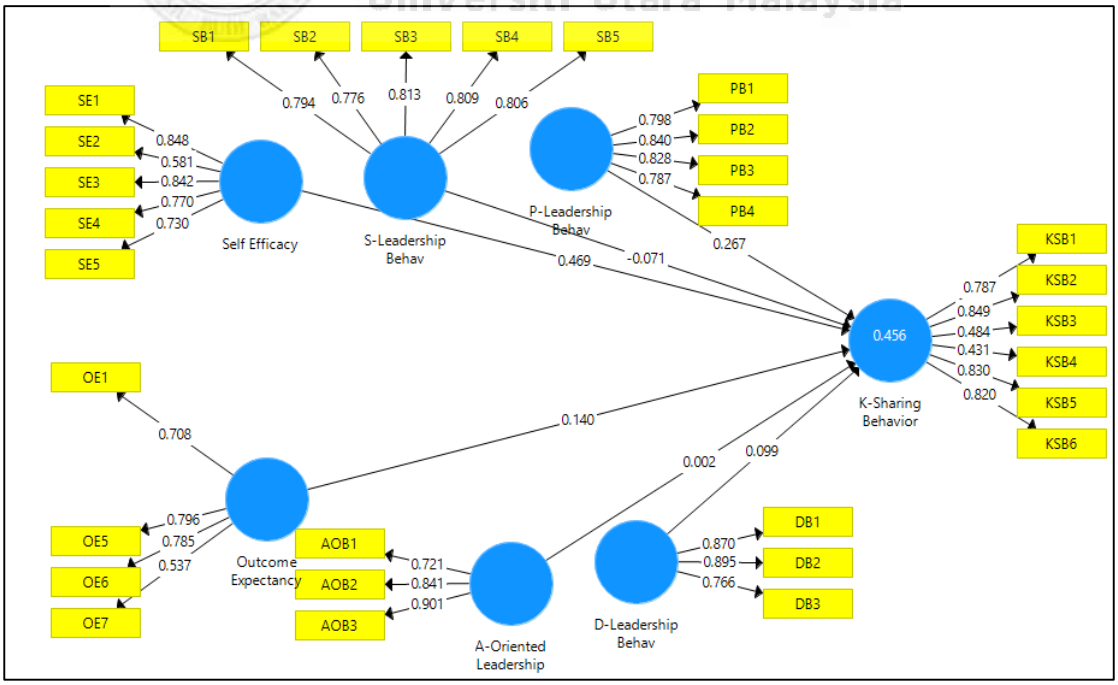


Figure 5.1. Measurement Model

Table 5.10:
Cross Loadings

Constructs	AOB	DB	KSB	OE	PB	SB	SE
AOB1	**0.721**	0.479	0.159	0.360	0.392	0.446	0.066
AOB2	**0.841**	0.510	0.201	0.395	0.498	0.509	0.079
AOB3	**0.901**	0.515	0.330	0.446	0.566	0.573	0.123
DB1	0.498	**0.870**	0.316	0.346	0.398	0.502	0.156
DB2	0.491	**0.895**	0.273	0.384	0.395	0.534	0.179
DB3	0.545	**0.766**	0.234	0.326	0.434	0.536	0.116
KSB1	0.154	0.197	**0.787**	0.206	0.238	0.096	0.489
KSB2	0.229	0.278	**0.849**	0.314	0.419	0.252	0.538
KSB3	0.379	0.317	**0.484**	0.401	0.437	0.374	0.152
KSB4	0.262	0.235	**0.431**	0.308	0.195	0.274	0.176
KSB5	0.226	0.256	**0.830**	0.320	0.376	0.263	0.471
KSB6	0.146	0.183	**0.820**	0.192	0.279	0.137	0.514
OE1	0.314	0.271	0.290	**0.708**	0.396	0.408	0.246
OE5	0.406	0.368	0.290	**0.796**	0.433	0.447	0.212
OE6	0.386	0.306	0.311	**0.785**	0.390	0.460	0.118
OE7	0.282	0.237	0.187	**0.537**	0.112	0.252	0.077
PB1	0.428	0.359	0.424	0.371	**0.798**	0.498	0.251
PB2	0.494	0.384	0.371	0.493	**0.840**	0.558	0.186
PB3	0.587	0.485	0.293	0.407	**0.828**	0.587	0.161
PB4	0.471	0.355	0.352	0.324	**0.787**	0.508	0.168
SB1	0.531	0.505	0.271	0.490	0.543	**0.794**	0.095
SB2	0.449	0.455	0.254	0.407	0.525	**0.776**	0.048

Table 5.10 (Continued)

Constructs	AOB	DB	KSB	OE	PB	SB	SE
SB3	0.474	0.482	0.263	0.436	0.522	**0.813**	0.173
SB4	0.502	0.489	0.206	0.458	0.489	**0.809**	0.070
SB5	0.545	0.539	0.187	0.452	0.545	**0.806**	0.077
SE1	0.025	0.129	0.539	0.115	0.193	0.087	**0.848**
SE2	0.042	0.100	0.249	0.160	0.033	0.003	**0.581**
SE3	0.110	0.114	0.488	0.098	0.193	0.079	**0.842**
SE4	0.178	0.185	0.411	0.287	0.242	0.181	**0.770**
SE5	0.090	0.159	0.434	0.275	0.209	0.081	**0.730**

Note: SE = self-efficacy; OE = outcome expectancy; SB = supportive leadership behavior; DB = directive leadership behavior; PB = participative leadership behavior; AOB = Achievement-oriented leadership.

5.13.2 Content Validity

A content validity concerns the extent to which an instrument is adequately represents all elements of a concept and reviewed by the group of experts or key persons on the field. Sekaran (2003) stressed that an instrument is considered validated if it is evaluated by a group of expert judges in the field of research .Establishing content validity is important as it represents the appropriateness of the items on the instrument for measuring constructs (Lewis et al., 2005; Straub et al., 2004). Each of the items should be representative of the construct and comprehensively cover all aspects of the construct.

For this study, a number of experts were approached for their opinions relating to knowledge sharing using online programming communities and the questionnaire design and to evaluate the measurement properties and the relationships specified in the structural model. Based on the IS literature, it is highly advisable to have rounds of content validity with different groups of experts (Straub, 1989). Through the content validity, experts are allowed to identify items that could be added or deleted from the instrument, and make suggestions for enhancements, if necessary (Lewis et al., 2005).

Thus in this study, groups of experts were consulted. The first group consisted of Four (4) IS Lecturers from Universiti Utara Malaysia. They were approached for their expertise in IS research and their experience conducting a research related to online community and knowledge sharing. The experts consulted are Assoc. Prof Azizah Ahmad (Expert in Information System, Bussiness Analytics and Digital Information), Dr Mazida Ahmad (Expert in Knowledge Management), Dr Alawiyah Abdul Wahab (Expert in E-Learning, E-Commerce & Internet Application) and Dr Ishola Dada Muraina (Information Technology & Digital Information). Meanwhile, a senior

lecturer, Mr. Norhisham Haron in SQS Statistical Consulting department from UUM, expert in instrument development and sampling also has validated the instruments and comment on the questionnaire's design and research methodology. Each of the items is reviewed by the experts for its content, scope, and purpose. Experts are asked to comment on various aspects of the survey design such as the clarity or ambiguity of definitions, item representativeness, appropriateness of the scale, and clarity of instructions. This procedure is conducted to establish the questionnaire's content validity. As a result, from the discussions with experts, wording changes were made; no items were removed or added; and some new demographic questions were added to the Web survey. The experts observations and suggestions were taken into consideration and shown in Appendix B.

5.13.3 Convergent Validity

Normally, convergent validity of the constructs holds when the measures of the constructs are firstly proved to be related to each other theoretically. This should be solidified statistically via content validity analysis involving three types of estimations: factor loadings, composite reliability (CR), and average variance extracted (AVE), given the position of Joseph et al. (2010) which indicates that factor loadings, composite reliability (CR), and average variance extracted (AVE) are used to establish convergent validity. This was done in the present study.

As depicted in Table 5.11 below, all the indicators' loadings were checked out, found to be higher than 0.40, and thus acceptable in the literature of multivariate analysis (Fornell & Larcker, 1981; Joseph et al., 2010; Stevens, 2012). The next values examined were that of convergent reliability which shows the extent to which the

indicators steadily seek to indicate the latent construct (Joseph et al., 2010). The composite reliability values for all constructs are above the threshold value of 0.70 (Fornell & Larcker, 1981; Joseph et al., 2010) ranging between 0.803 and 0.899, and thus confirmed the convergent reliability of the constructs of the study.

To conclude the convergent validity test, the average variance extracted (AVE), which refers to the level of common variance among the latent construct indicators of a given research (Hair et al., 2006), was checked out and found to be higher than the threshold of 0.50 (Fornell & Larcker, 1981; Joseph et al., 2010). As indicated in Table 5.11, the AVE values ranged between 0.510 and 0.715. Thus, the results which were discerned from the constructs' loadings, convergent reliability, and AVE affirm the internal consistency and convergent validity of the constructs of this study.

Table 5.11.
Internal Consistency and Convergent Validity

Constructs	**Items**	**Loadings**	**AVE**	**CR**	**CA**
Achievement -Oriented Leadership	AOB1	0.721	0.680	0.863	0.777
	AOB2	0.841			
	AOB3	0.901			
Directive Leadership Behavior	DB1	0.870	0.715	0.882	0.800
	DB2	0.895			
	DB3	0.766			
Knowledge Sharing Behavior	KSB1	0.787	0.520	0.860	0.799
	KSB2	0.849			
	KSB3	0.484			
	KSB4	0.431			
	KSB5	0.830			
	KSB6	0.820			
Outcome Expectancy	OE1	0.708	0.510	0.803	0.674
	OE5	0.796			
	OE6	0.785			
	OE7	0.537			
Participative -Leadership Behavior	PB1	0.798	0.662	0.887	0.831
	PB2	0.840			
	PB3	0.828			

	PB4	0.787			
Supportive Leadership Behavior	SB1	0.794	0.640	0.899	0.860
	SB2	0.776			
	SB3	0.813			
	SB4	0.809			
	SB5	0.806			
Self-Efficacy	SE1	0.848	0.578	0.871	0.816
	SE2	0.581			
	SE3	0.842			
	SE4	0.770			
	SE5	0.730			

5.13.4 Discriminant Validity

The essence of discriminant validity is to check the construct validity of the outer model in which it should certify that the measures which shouldn't be related, are really not found related after conducting the analysis. It also denotes each measure is more related to its own respective constructs than to other constructs. As posited by Chin (2010), and Fornell and Larcker (1981), conducting discriminant validity test involves checking out the square roots of average variance extracted (AVE), which should be more than 0.50, with correlations among the constructs of the study.

In addition to the cross-loadings criterion, which established the discriminant validity of the construct under study (see Table 5.10), the Fornell-Larcker criterion was evaluated. As depicted in Table 5.12 below, the diagonal values, indicating the square root of AVE of the respective constructs, are higher than the other values of the column and the row in which they are positioned, and thus confirming the discriminant validity of the outer model. Given this result and the fact that the valid constructs do provide conclusions which in to bring about generalization of research findings, it is logical to posit that the subsequent analyses' results, most especially testing of hypotheses, will be valid and reliable.

Moreover, given the fact that the recent research that critically examined the performance of cross-loadings and the Fornell-Larcker criterion for discriminant validity assessment has found that the two approaches could not reliably detect discriminant validity issues (Henseler et al., 2015), heterotrait-monotrait ratio (HTMT) of the correlations was evaluated to complement the two criteria. HTMT is the ratio of the between-trait correlations to the within-trait correlations (Hair et al., 2017). The result in Table 5.13 confirms the discriminant validity of this study's constructs, as the HTMT values for all pairs of constructs in a matrix fell below the threshold value of 0.90. In addition to evaluation of the HTMT ratios, the HTMT values were tested via bootstrapping method and found that they are significantly different from 1, and thus signify that the constructs have discriminant validity (Henseler et al., 2015).

In sum, having confirmed the content validity, convergent validity, and discriminant validity of the constructs of this research, it can then be claimed that the construct validity has been established in this study.

Table 5.12.
Discriminant Validity (Fornell-Larcker Criterion)

Construct	AOB	DB	KSB	OE	PB	SB	SE
AOB	0.825						
DB	0.600	0.846					
KSB	0.301	0.328	0.721				
OE	0.489	0.416	0.384	0.714			
PB	0.601	0.480	0.451	0.490	0.814		
SB	0.623	0.615	0.301	0.561	0.657	0.800	
SE	0.115	0.180	0.576	0.235	0.241	0.119	0.760

Note: SE = self-efficacy; OE = outcome expectancy; SB = supportive leadership behavior; DB = directive leadership behavior; PB = participative leadership behavior; AOB = Achievement-oriented leadership; KSB = knowledge sharing behavior.

Table 5.13.
Discriminant Validity (HTMT criterion)

Constructs	AOB	DB	KSB	OE	PB	SB	SE
AOB							
DB	0.771						
KSB	0.386	0.428					
OE	0.664	0.567	0.557				
PB	0.735	0.601	0.553	0.624			
SB	0.751	0.749	0.389	0.723	0.779		
SE	0.136	0.223	0.665	0.348	0.273	0.151	

Note: SE = self-efficacy; OE = outcome expectancy; SB = supportive leadership behavior; DB = directive leadership behavior; PB = participative leadership behavior; AOB = Achievement-oriented leadership; KSB = knowledge sharing behavior.

Table 5-14:
Confidence Intervals

	Original Sample (O)	Sample Mean (M)	5.0%	95.0%
DB -> AOB	0.771	0.772	0.693	0.848
KSB -> AOB	0.386	0.386	0.292	0.482
KSB -> DB	0.428	0.428	0.321	0.532
OE -> AOB	0.664	0.664	0.568	0.760
OE -> DB	0.567	0.567	0.450	0.677
OE -> KSB	0.557	0.559	0.454	0.661
PB -> AOB	0.735	0.736	0.655	0.812
PB -> DB	0.601	0.601	0.514	0.687
PB -> KSB	0.553	0.554	0.462	0.640
PB -> OE	0.624	0.630	0.534	0.722
SB -> AOB	0.751	0.752	0.683	0.820
SB -> DB	0.749	0.749	0.670	0.823
SB -> KSB	0.389	0.393	0.307	0.481
SB -> OE	0.723	0.723	0.639	0.804
SB -> PB	0.779	0.779	0.716	0.837
SE -> AOB	0.136	0.164	0.095	0.257
SE -> DB	0.223	0.229	0.122	0.345
SE -> KSB	0.665	0.669	0.584	0.752
SE -> OE	0.348	0.359	0.254	0.468
SE -> PB	0.273	0.284	0.198	0.373
SE -> SB	0.151	0.175	0.115	0.250

Note: SE = self-efficacy; OE = outcome expectancy; SB = supportive leadership behavior; DB = directive leadership behavior; PB = participative leadership behavior; AOB = Achievement-oriented leadership; KSB = knowledge sharing behavior.

5.14 Evaluation of Predictive Relevance of the Model

Data analysis via PLS SEM requires that the researchers should rely on measures which will indicate the predictive abilities of the model with the purpose of estimating the quality of the model (Joseph et al., 2010). Besides, predictive quality of a model can be measured (Fornell, 1994; Hair et al., 2012) through cross-validated redundancy measure which is represented as Q2, a frequently found sample re-used method (Geisser, 1974).

Moreover, Fornell (1994) opined that a model is considered to have predictive validity if the redundant communality is bigger than zero for all endogenous variables, if otherwise, a model is held to have no predictive relevance. The process of estimating predictive relevance of a model in PLS software in this study involves blindfolding technique in which the estimation of parameters is by excluding some of the data and by handling them as missing values (Fararah & Al-Swidi, 2013), and then processing the estimated parameters so as to rebuild the raw data which were assumed previously as missing and consequently create general cross-validating metrics (Q2) (Chin, 1998). However, given the position of Chin (2010), there can be various forms of Q2 subject to the form of desired prediction. When the primary latent variable score cases are used for predicting data points, a cross-validated communality is obtained, but a cross-validated redundancy is obtained when the latent variables which predict the block in question are used for predicting the data points (Chin, 1998; Duarte & Raposo, 2010).

In Table 5.15 below, the cross-validated redundancies for the endogenous variable (knowledge sharing behaviour) are 0.215. These values reflect adequate predictive capabilities of the model based on Fornell (1994) criteria which necessitated these values to be larger than zero.

Table 5.15.
Predictive Quality Indicators of the Model

Constructs	R2	SSO	SSE	Q^2 (=1-SSE/SSO)
Knowledge Sharing Behavior	0.474	1932	1516.65	0.214984

5.15 Structural Model (Inner Model) Evaluation and Hypothesis Testing

Having done with the measurement model evaluation, the next step involved checking out the standardized path coefficients through which for the hypothesized nexuses will be tested. Also, the accuracy of the estimates and significance tests will be done via bootstrapping technique which is rooted in Smart PLS software as recommended by Chin (1998), and Tenenhaus, Vinzi, Chatelin, and Lauro (2005).

5.15.1 Hypothesis Testing and T-Values for Direct Hypotheses

As depicted in Table 5.14, PLS algorithm was run to generate the path coefficients and bootstrapping with a number of 5000 bootstrap samples and 322 cases was also run to examine significance of the path coefficients (Hair et al., 2011; Hair et al., 2012; Hair Jr et al., 2016; Henseler et al., 2009). The purpose of running the model with all variables was to establish the results of direct nexuses originating from the research objectives of this study.

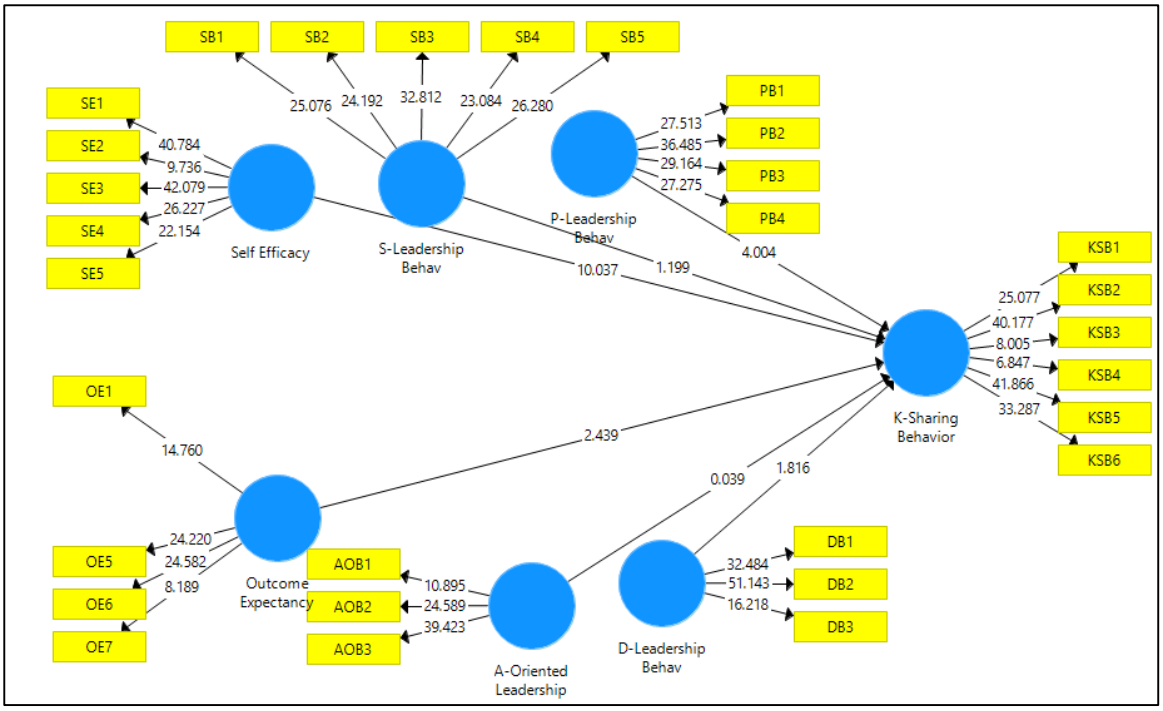


Figure 5.2. Path Model Results (t-values): Direct Hypotheses

The path model results yielded t-values as shown in Figure 5.2, and the path model significance results yielded t-values as shown in Figure 5.3 which was generated from bootstrapping technique further led to calculating p-values for all direct relationships (H1-H2), and finally became a basis for reaching to the conclusion about whether a hypothesis is supported or not.

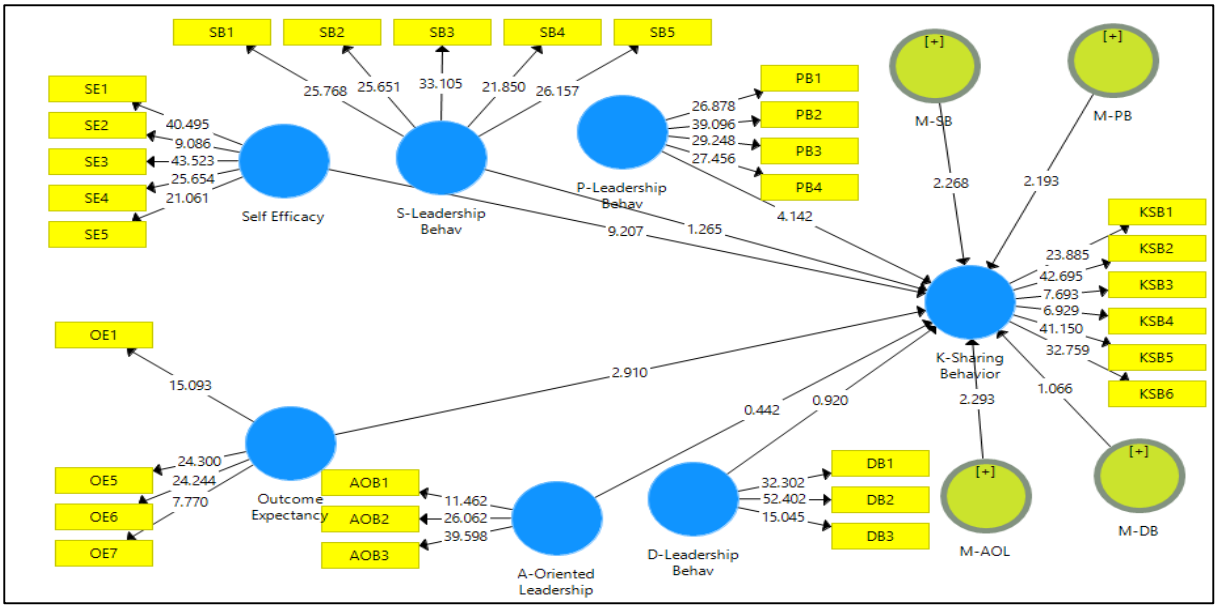


Figure 5.3. Full Model with Interaction Terms

The result of structural model, otherwise known as inner model, was depicted in Table 5.16 below. Based on this result, hypothesis 1 (H1) which stated that self-efficacy has a positive effect on knowledge sharing behavior, is supported at 0.001 level of significance (β=0.469, t=10.325, p<0.001). Likewise, second hypothesis H2 was also supported at 0.05 level of significance (β=0.140, t=2.501, p<0.05). This result indicates a significant positive nexus between outcome expectancy and knowledge sharing behavior. Hence, all the direct hypotheses were supported.

Table 5.16.
Inner Model Results

	Path coefficient	T-Values	P Values	Decision
OE-> KSB	0.140	2.501	0.006	Supported
SE -> KSB	0.469	10.325	0.000	Supported

***: P<0.01; **: P<0.05; *: P<0.1

5.15.2 Evaluation of Variance Explained in the Endogenous Latent Variables

Included as part of the structural model evaluation is R-squared value which is represented by R^2 (Hair et al., 2011; Hair et al., 2012; Henseler et al., 2009). R-squared

value, otherwise known as coefficient of determination, stands for the proportion of variation in the dependent variable(s) that can be explained by one or more predictor variable (Elliott & Woodward, 2007; Hair et al., 2006; Joseph et al., 2010). Determining the acceptable level of R2 value is contingent on the research context (Joseph et al., 2010), but R^2 value of 0.10 was claimed by Falk and Miller (1992) to be minimum acceptable level. Going by the position of Chin (1998), R^2 values of 0.19, 0.33, and 0.67 are regarded weak, moderate, and substantial respectively.

In this study, Table 5.17 showed the R^2 values of the endogenous latent variable (i.e. knowledge sharing behavior). The research model explains 47.4 percent of the total variance in knowledge sharing behavior, indicating that all the exogenous latent variables (self-efficacy, outcome expectancy, supportive leadership behavior, participative leadership behavior, achievement-oriented leadership, and directive leadership) jointly explain 47.4 percent of the variance in knowledge sharing behavior. Therefore, this result signified that the endogenous latent variable showed moderate and acceptable levels of R-squared values.

Table 5.17.
Variance Explained in the Endogenous Latent Variables

Latent Variables	Variance Explained (R^2)
	47.4 %

5.15.3 Testing Moderating Effects

In this study, supportive leadership behavior and participative leadership behavior were proposed to moderate the relationship between self-efficacy and knowledge sharing behavior in a positive manner, covering hypotheses 3 and 4. Likewise, achievement-oriented leadership and directive leadership behavior were proposed to moderate the

relationship between outcome expectancy and knowledge sharing behavior in a positive manner, covering hypotheses 5 and 6.

To estimate the moderation and moderating effects, product indicator approach via PLS-SEM was used (Chin et al., 2003; Helm, Eggert, & Garnefeld, 2010; Henseler & Chin, 2010; Henseler & Fassott, 2010). The product term approach, which is considered equal or better than the group comparison approaches (Henseler & Fassott, 2010), is deemed fit for testing moderation and moderating effect in the present study, since the moderating variable is continuous, and thus in line with supposition of Rigdon, Schumacker, and Wothke (1998). The product term approach with regards to this study involves creation of product term between exogenous variable (i.e., self-efficacy and outcome expectancy) and moderator (i.e., supportive leadership behavior, participative leadership behavior, achievement-oriented leadership, and directive leadership) in which the product will serve as indicators of the interaction term in the structural model (Kenny & Judd, 1984). In addition, Cohen (1988) rules were followed with regards to estimation of effect size in order to determine the strength of the moderating effects.

According to Table 5.18 which displayed the result below, it can be discerned that hypothesis 3 was supported (β=0.130, t=2.268, $p<0.05$). Also, in Figure 5.4, which represent self-efficacy-supportive leadership behavior interaction plot (Dawson, 2014), the line tagged high supportive leadership behavior, indicating presence of supportive leadership behavior, has a steeper gradient in contrast to low supportive leadership behavior (lack/shortage of supportive leadership behavior). This signified that positive relationship between self-efficacy and knowledge sharing behavior get stronger for leaders with high supportive leadership behavior.

Similarly, hypothesis 5 was supported (β=0.115, t= 2.293, p<0.05). Also, in Figure 5.6, which represent outcome expectancy- achievement-oriented leadership interaction plot (Dawson, 2014), the line tagged high achievement-oriented leadership, indicating presence of achievement-oriented leadership, has a steeper gradient in contrast to low achievement-oriented leadership (lack/shortage of achievement-oriented leadership). This signified that positive relationship between outcome expectancy and knowledge sharing behavior get stronger for leaders with high achievement-oriented leadership.

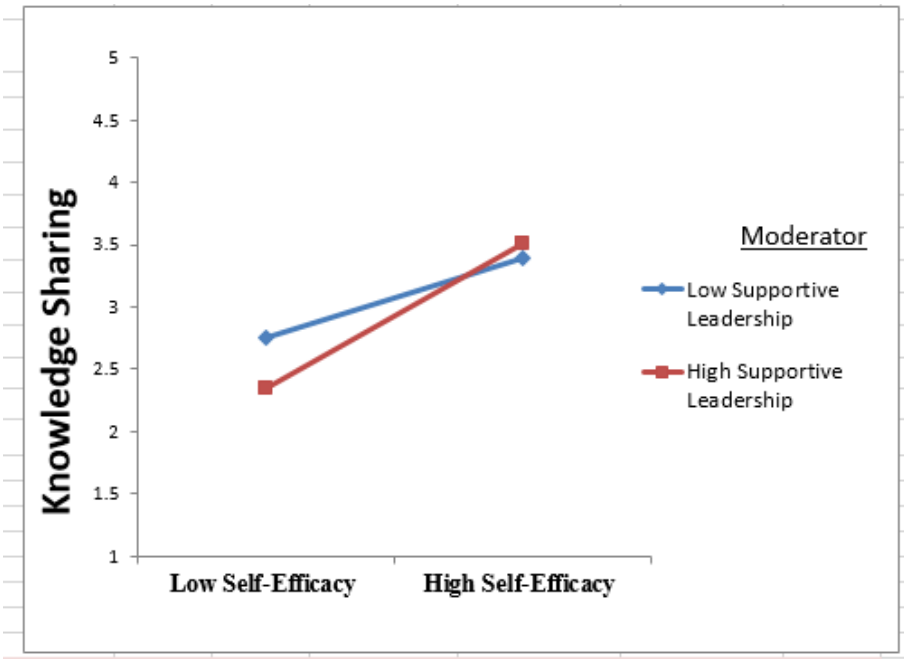
Furthermore, hypothesis 4 was supported, indicating the moderating effect of participative leadership behavior on self-efficacy-knowledge sharing behavior connection. In Figure 5.5, the line tagged high participative leadership behavior, indicating presence of participative leadership behavior, has a steeper gradient in contrast to low participative leadership behavior (lack/shortage of participative leadership behavior). This signified that positive relationship between self-efficacy and knowledge sharing behavior get stronger for leaders with high participative leadership behavior. Moreover, since the outcome expectancy-directive leadership behavior interaction effect on knowledge sharing behavior is not significant, hypothesis 6 was thus not supported.

Table 5.18.
Results of Moderating Effects

Hypotheses	Beta	T Statistics	P Values	Decision
M-AOB -> KSB	0.115	2.293	0.011	**Supported**
M-DB -> KSB	-0.056	1.066	0.143	**Not Supported**
M-PB -> KSB	0.119	2.193	0.014	**Supported**
M-SB -> KSB	0.130	2.268	0.012	**Supported**
OE -> KSB	0.163	2.910	0.002	Supported
SE -> KSB	0.451	9.207	0.000	Supported

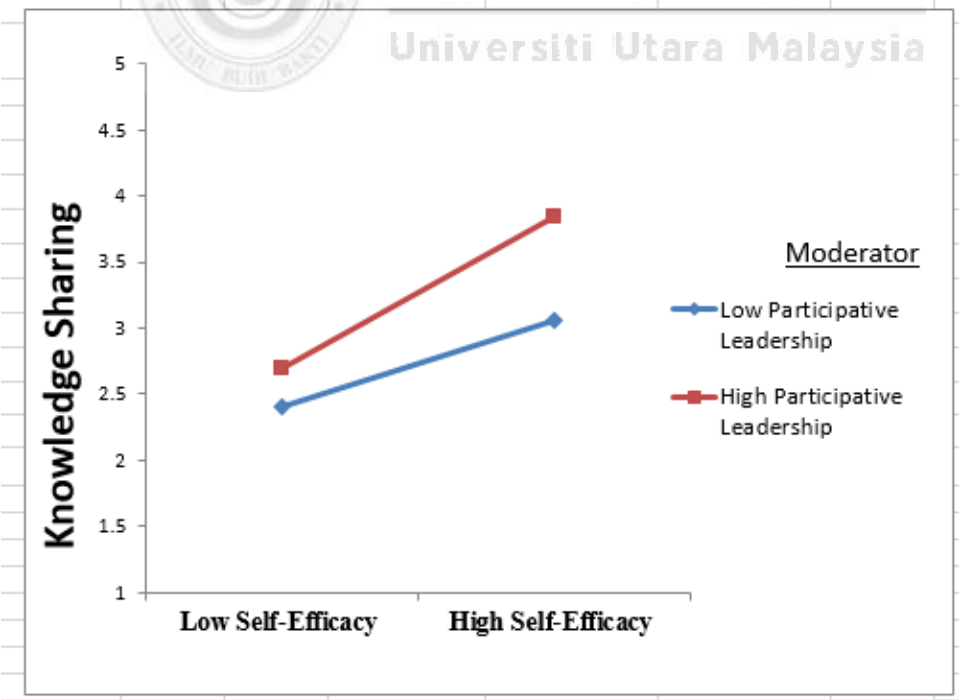
***: P<0.01; **: P<0.05; *: P<0.1

Note: SE = self-efficacy; OE = outcome expectancy; SB = supportive leadership behavior; DB = directive leadership behavior; PB = participative leadership behavior; AOB = Achievement-oriented leadership; KSB = knowledge sharing behavior.



Supportive Leadership strengthens the positive relationship between Self-Efficacy and Knowledge Sharing.

Figure 5.4. SE-SB Interaction Effect on Knowledge Sharing Behavior



Participative Leadership strengthens the positive relationship between Self-Efficacy and Knowledge Sharing.

Figure 5.5. SE-PB Interaction Effect on Knowledge Sharing Behavior

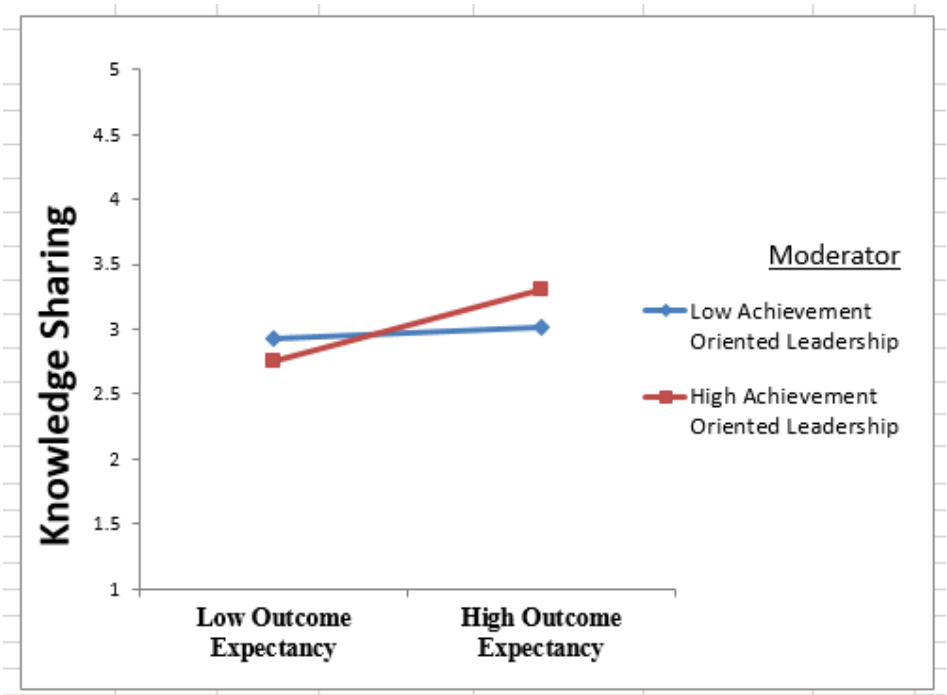


Figure 5.6. OE-AOB Interaction Effect on Knowledge Sharing Behavior.

5.16.3.1 Evaluation of Strength of the Moderating Effects

Based on Cohen (1988) formula for effect sizes, the strength of the moderating effects of supportive leadership behavior and participative leadership behavior on the relationship between self-efficacy and knowledge sharing behavior and moderating effects of achievement-oriented leadership and directive leadership behavior on the relationship between outcome expectancy and knowledge sharing behavior were estimated. The formula is as follows:

$$\text{Effect Size of Moderator } (F^2) = \frac{R^2 \text{ model with moderator} - R^2 \text{ model without moderator}}{1 - R^2 \text{ model with moderator}}$$

According to Cohen (1988) and Henseler and Fassott (2010), the moderating effect sizes (f^2) values of 0.02, 0.15 and above 0.35 can be regarded as weak, moderate and strong respectively. However, according to Chin et al. (2003), a low effect size does not necessarily mean that the underlying moderating effect is insignificant. "Even a small interaction effect can be meaningful under extreme moderating conditions, if the resulting beta changes are meaningful, then it is important to take these conditions into account" (Chin et al., 2003, p. 211).

Based on Cohen (1988) and Henseler and Fassott (2010) guidelines, the result of the strength of the moderating effects of supportive leadership behavior and participative leadership behavior on the relationships between self-efficacy and knowledge sharing behavior, and the moderating effects of achievement-oriented leadership and directive leadership on the relationships between outcome expectancy and knowledge sharing behavior were presented in Table 5.19. The results indicated that the moderating effect size of supportive leadership behavior and participative leadership behavior on the relationships between self-efficacy and knowledge sharing behavior were 0.019 and 0.072 respectively. This signifies that the moderating effect size of both moderating constructs are small. Equally, the moderating effect size of achievement-oriented leadership and directive leadership on the relationships between outcome expectancy and knowledge sharing behavior were 0.017 and 0.008 respectively. This signifies that the moderating effect size of both moderating constructs are also small (Henseler, Wilson, Götz, & Hautvast, 2007; Wilden, Gudergan, Nielsen, & Lings, 2013).

Table 5.19.
Strength of the Moderating Effects on KSB (Effect size of moderators)

Moderators	R2 incl.	R2 excl.	F2	Effect Size
M-SB	0.474	0.464	0.019	Small
M-PB	0.474	0.436	0.072	Small
M-AOL	0.474	0.465	0.017	Small
M-DB	0.474	0.47	0.008	Very Small

Note: SE = self-efficacy; OE = outcome expectancy; SB = supportive leadership behavior; DB = directive leadership behavior; PB = participative leadership behavior; AOB = achievement-oriented leadership.

Although, the moderating effect size of the four leadership behaviour are small if calculated separately, however when combine all this moderating effect size of the four leadership behaviour, it shows a moderate effect size as calculated using formula prescribed by Cohen (1988):

$$F^2 = R2i - R2m / 1 - R2i$$

$$= 0.474 - 0.39 / 1 - 0.474$$

$$= 0.16$$ (Here, i = interaction model, m = main effect model)

5.16 Summary of Hypotheses' Results

Table 5.20 contained the summary of hypotheses results of this research. Out of 6 hypotheses, 5 hypotheses were supported while the remaining one hypothesis was not supported. This is presented as follows:

Table 5.20.
Hypotheses' Summary

Hyp.	Hypothesized Path	Decision
	Direct Relationships	
H1	SE -> KSB	Supported
H2	OE -> KSB	Supported
	Moderating Effects	
H3	SE * SB -> KSB	Supported
H4	SE * PB -> KSB	Supported
H5	OE * AOB -> KSB	Supported
H6	OE * DB -> KSB	Not Supported

5.17 Summary of the Chapter

Over all, data analysis bordering on initial data screening and preliminary analysis, descriptive analysis, and inferential analysis using both SPSS version 21 and Smart PLS 3.0 M3 software were conducted. To test the proposed hypotheses structural model and complementary PLS-SEM analysis involving testing of moderating effects in the structural model were examined. The results of the analysis indicate that out of six proposed hypotheses, five hypotheses were supported while the remaining one hypothesis was not supported.

CHAPTER 6 :

DISCUSSION AND CONCLUSION

6.1 Introduction

This chapter begins with a review of the research questions, hypothesis and literature reviews. We will then evaluate the findings and compare them with the literature presented earlier in this thesis. There will also be some theoretical and practical contributions presented, together with the implications of the analysis. The research limitations will be addresses and some suggestions on future research will be given. This chapter will end with a final conclusion.

6.2 Overview of the Findings of the Study

This study aims to assess the effect of personal cognitive factors on knowledge sharing behavior. The basis of this research is drawn from the Path-Goal theory and Social Cognitive theory. In addition, the research also investigates the impact of four types of leadership behavior on the relationship between the personal cognitive attributes and knowledge sharing behavior. All in all, this research has provided meaningful insights on the research topic and deepens the understanding of knowledge management (KM) research. Table 6.1 reviews the hypotheses of this study:

Table 6.1

Research Hypothesis

	Research Hypothesis Statements	Result
H1	Self-efficacy has a positive effect on knowledge sharing.	Supported
H2	Outcome expectancy has a positive effect on knowledge sharing behavior.	Supported
H3	Supportive leadership behavior positively moderates the effect of self-efficacy on knowledge sharing.	Supported
H4	Participative leadership behavior positively moderates the effect of self-efficacy on knowledge sharing.	Supported
H5	Achievement oriented leadership behavior positively moderates the effect of outcome expectancy on knowledge sharing.	Supported
H6	Directive leadership behavior positively moderates the effect of outcome expectancy on knowledge sharing.	Not Supported

Based on Table 6.1, 5 out of the 6 hypotheses were supported. Generally, the findings reflected that personal cognitive attributes (i.e., self-efficacy and outcome expectancy) have a positive effect on knowledge sharing behavior. The findings supported the moderating role of participative leadership behavior, supportive leadership behavior, and achievement-oriented leadership behavior on the relationship between personal cognitive attributes and knowledge sharing. Nevertheless, directive leadership was found to not have the same impact.

This discussion will firstly dwell on the direct correlation between personal cognitive factors (i.e., self-efficacy and outcome expectancy) and knowledge sharing behavior.

We will then elaborate on the interactional impact of leadership behaviors on the relationship between personal cognitive factors and knowledge sharing behavior. The following subsections discuss direct paths and moderating paths.

6.3 Direct Relationships

In Path-Goal theory, leadership behavior must align with individual characteristics. In evaluating the individual characteristics in this study, Social Cognitive theory is adopted as it discusses the concept of perceived task ability and perceived level of outcome. Both of these characteristics are equivalent to self-efficacy and outcome expectancy. This subsection will evaluate the direct paths involve of the relationship between personal cognitive factors (i.e., self-efficacy and outcome expectancy) and knowledge sharing behavior. This is assessed in the following section.

6.3.1 Self-Efficacy and Knowledge Sharing.

With regard to the first research hypothesis of this study, this section is dedicated to a discussion on examining the relationship between self-efficacy and knowledge sharing. Self-efficacy refers to an "individual beliefs in his ability to organize and execute a required action to produce given attainments" (Bandura, 1997a, p. 3). This study hypothesized that self-efficacy is positively and significantly related to knowledge sharing behavior (H1). Consistent with the Social Cognitive Theory (SCT) and previous study, the result revealed a significant positive relationship between self-efficacy and knowledge sharing behaviour. These results follow the direction of previous studies (Bock & Kim, 2001; Cabrera et al., 2006; Kankanhalli et al., 2005; Liao et al., 2013; Zhang et al., 2017) that found a positive correlation between self-efficacy and knowledge sharing behavior. In short, self-efficacy increases individuals' confidence

in participating in knowledge sharing activities in online programming communities, and the results from this research further supported this hypothesis.

The results showed that self-efficacy is a strong predictor of knowledge sharing behavior. This result proved that when a person perceives themselves as knowledgeable and able to share their knowledge successfully with other members, they are more likely to contribute in online programming communities.

These findings are congruent with SCT. This theory suggests that self-efficacy is an important element of intrinsic motivation for knowledge sharing (Hsu et al., 2007; Liao et al., 2013). In addition, SCT stresses the idea that doubt in personal knowledge will negatively impact knowledge sharing behavior. Such insight is important as the current complexity in knowledge sharing among community members may be due to self-efficacy deficits (Liao et al., 2013). Apart from that, this theory argues that intention to share knowledge is an insufficient motivation. One must also believe that he has the ability to author knowledge content, code knowledge into "knowledge objects" by adding context, contribute personal knowledge to the online community database, share personal knowledge in a formal interaction with or across teams or work units, or in informal interactions among individuals (Hsu et al., 2007). This research supports and solidifies the presuppositions of the Social Cognitive theory.

6.3.2 Outcome Expectancy and Knowledge Sharing.

Another individual's characteristic grounded on Social Cognitive theory is outcome expectancy. The second hypothesis (H2) stated that there is a positive relationship between outcome expectancy and knowledge sharing in an online programming community.

The Social Cognitive theory argues that an individual's behavior is influenced by personal cognitive factors (Bandura, 1989). Individuals participate in an online programming community to get information, seek for knowledge, and solve various problems in addition to treating the community as a point to interact with other people, to get relevant support, make friends and feel a sense of contentment (Faraj et al., 2011; Andrews, 2002). Most members try to set up a mutual social relationship with different classes of people who are also members of the online programming community.

With regard to the Social Cognitive theory, outcome expectancy refers to the anticipated consequence of one's personal behavior (Bandura, 1997a; Compeau and Higgins, 1999; Androulaki-Ralli, 2015). Outcome expectancy consists of three major categories : physical categories (e.g., pleasure, pain, and discomfort), social categories (e.g., social recognition, monetary rewards, power, and applause) and self-evaluation categories (e.g., self-satisfaction, self-devaluation) (Bandura, 1997a). In each of these categories, positive expectations are the motivations and consequent behavior controlled by effects (Bandura, 1997a). These categories impact knowledge sharing in the online programming community.

This result is consistent with the SCT theory, which postulates that outcome expectancy is an important predictor of knowledge sharing behavior (Faraj et al., 2011; Hsu et al., 2007). These expectations are incentives that may regulate human behavior (Bandura, 1997a). In these three types of outcome expectancy, social effect is the most prominent aspect of outcome expectancy. It is worth noting that it has a higher importance in the virtual environment as most individuals in online programming communities behave with rational self-interest (Bock & Kim, 2001; Carron-Arthur, Ali, Cunningham, & Griffiths, 2015). This relates to the reason why knowledge sharing will occur when the rewards are higher than cost (Constant et al., 1994). In all, the result suggests that

individuals in online communities will have a higher tendency to share their knowledge when they expect to receive some positive physical or social outcomes.

Moreover, researchers have suggested that a person is stimulated by behaviors that are expected to result in favorable consequences (Bandura, 1994; Bock et al., 2005; Xu et al., 2009). Knowledge sharing behavior can be cultivated if members perceive their own knowledge needs and goals (Van den Hooff & de Leeuw van Weenen, 2004) or if they anticipate reciprocal knowledge sharing from others (Bock et al., 2005). There have been many studies (Butler et al., 2002; Chiu et al., 2006; Compeau et al., 1999; DiSalvo, 2014; Dowling & Rickwood, 2016; Hsu et al., 2007) that demonstrate the more a person values the outcomes and the higher the expectancy, the more likely the behavior will occur. In addition, some studies such as Andrews (2002) and Zhang and Hiltz (2003) suggested that individuals would share knowledge within online communities with the expectations of enriching knowledge, seeking support, and making friends. Meanwhile, Butler et al. (2002) members share their knowledge to be seen as knowledgeable, skilled and obtain respect. Apart from that, previous studies state that some individuals share their knowledge to help the community grow, accumulate knowledge and continue the community's operation (Bock & Kim, 2001; Kolekofski Jr & Heminger, 2003; Lesser, 2000; Safadi & Berente, 2019). Previous studies also show that if an individual assume that they can tighten the bond with others by sharing knowledge, they will be more willing to offer and share their knowledge with others (Chiu et al., 2006; Dong et al., 2016; Wasko & Faraj, 2005).

Having said that, this study found a positive contribution of outcome expectancy to knowledge sharing behavior. The findings of the current study indicate that self-efficacy and outcome expectancy positively influence knowledge sharing behavior and

answered the question of the relationship between self-efficacy and outcome expectancy on knowledge sharing behavior in online programming communities.

6.4 Moderating Effects of the Selected Dimensions Virtual Leadership Behavior

The current study explores how well can Path-Goal theory be integrated with Social Cognitive theory. This is done to develop the SCT and advance the knowledge management research field. This is based on the observation that how people interpret the results of their own behavior informs and alters their environments and the personal factors they possess. This will, in turn, inform and alter subsequent behavior (Bandura, 1986). Based on Path-Goal theory, certain leadership behavior that aligns with followers' characteristics may increase knowledge sharing behavior among members of the online programming community.

With regard to this, the current study aimed to examine whether the relationship between personal cognitive factors and knowledge sharing could be moderated by four types of leadership behaviors extracted from Path-Goal theory. Drawn upon the position of Hsu et al. (2007), the relationship between personal cognition (e.g., self-efficacy) and knowledge sharing behavior can be both direct and indirect. The present study examined the potential moderating effect of four dimensions of leadership behaviors on the relationship between personal cognition and knowledge sharing behavior. The next sub-sections explicate the findings in detail.

6.4.1 Moderating Effect of Supportive Leadership on the Relationship between Self-Efficacy and Knowledge Sharing

In line with the research objective, the third hypothesis (H3) aimed to investigate the relationship between self-efficacy and knowledge sharing as moderated by supportive

leadership. Such an approach is taken to understand how supportive leadership may enhance knowledge sharing in the online community.

The results reflected that the positive relationship between members' self-efficacy and knowledge sharing is amplified by supportive leadership behavior. This affirms the earlier assumption that a leader's behavior would affect followers' motivation in an online programming community. Apart from that, this result is also consistent with the Path-Goal theory. This theory explains that followers can be guided by leaders to attain goals by selecting an appropriate leadership behavior that can best suit the followers' situations and needs. Leaders with specific leadership behavior may increase followers' motivation and expectations for success (Northouse, 2016).

According to the Path-Goal theory discussed by House (1971) and House and Mitchell (1975), leaders with supportive leadership behaviors are concerned of their followers' needs, work for their welfare, and contribute to a friendly environment. Such behavior positively impacts the followers' behavior and induces positive behavior. Consequently, this will increase followers' self-efficacy and their willingness to share the knowledge with others. Followers with a supportive leader feel more satisfied and have higher self-confidence in sharing their knowledge (Wu & Lee, 2017). When followers receive support from leaders, they are in a better position to achieve their goals (La Rocco & Jones, 1978) (Wu & Lee, 2017) and facilitate knowledge sharing (Akpotu, 2013).

Furthermore, Imtiaz and Ahmad (2009) found that members who experienced supportive leadership demonstrate better behavior compared to members who lacked sufficient support from their leaders. Leaders support functions as a positive buffer in

increasing the level of self-efficacy towards sharing knowledge. In other words, leaders facilitate knowledge sharing of members in the online programming community.

Moving on, supportive leadership behaviors include listening to followers' concerns (Bordia et al., 2004; Van Quaquebeke & Felps, 2018), providing encouragement and positive feedback (Mumford, Connelly, & Gaddis, 2003; Sharma & Pearsall, 2016; Tierney, Farmer, & Graen, 1999), increasing their self-efficacy (Arbabi & Mehdinezhad, 2015; Redmond, Mumford, & Teach, 1993), and showing individual concern (Shin & Zhou, 2003). When leaders show individualized consideration and give encouragement and support, followers are more likely to focus on the tasks. They are also more encouraged to try new approaches, take risks and have higher self-confidence and personal responsibility (Deci et al., 1989; Shin & Zhou, 2003; Van Quaquebeke & Felps, 2018),. This will increase self-efficacy and intrinsic motivation towards knowledge sharing in online programming communities.

In online programming communities, the main characteristic of the members is voluntary behavior, making it difficult to motivate members to share their knowledge (Ipe, 2003; Yan, Wang, Chen, & Zhang, 2016). Supportive leadership moderates the relationship between self-efficacy and knowledge sharing. Through a motivational mechanism, leaders energize members by articulating a compelling vision and providing an appropriate model. A leader can serve to persuade members and empower their efficacy on their self-capability to contribute to the community vision by sharing their knowledge (Carton & Lucas, 2018; Kirkpatrick & Locke, 1996; Yukl, 1999).

Furthermore, researchers find that if individuals do not have enough motivation, they will tend to only acquire knowledge, and disregard sharing their knowledge. This is referred to as "knowledge sharing dilemmas" (Cabrera & Cabrera, 2002; Xiao, Zhang,

& Ordóñez de Pablos, 2017). It has been proven that a lack of knowledge sharing will further demotivate other members to do so (Ardichvili et al., 2003; Gharesifard & Wehn, 2016; Ghobadi & Mathiassen, 2016). If followers are demotivated, they tend to not perform their best and this will hinder goals achievement of the community. In contrast, satisfied members are more likely to effectively and normatively commit to the relationship and engage in behaviors that will maintain a healthy relationship, such as providing help or accommodating others' needs (Rusbult & Buunk, 1993; Ma & Agarwal, 2007). This will lead to more knowledge contribution.

Supportive leaders who are capable of effectively following the leadership theory understands this gap and will enhance the motivational profoundness of the said followers (members of online programming community) by giving more encouragement. Supportive leaders always enforce knowledge sharing or contribution culture in online programming community environment and encourage growth, efficacy, and collaboration to achieve the objectives of the online communities.

Furthermore, supportive leadership can enhance self-efficacy as well. By inspiring individuals with their passion, supportive leaders underpin individuals' willingness and ability to work on improving the status quo (Wu & Parker, 2017). The more frequent a follower is motivated by the leader, the higher the follower's self-confidence in making meaningful contributions to the online programming community. Supportive leadership also creates a strong bond between the leaders and the followers, ensuring a better understanding of the community's objective. This study has proven that the members' self-efficacy increases with supportive leadership behavior, which in turn facilitates members' knowledge sharing in online programming communities.

6.4.2 Moderating Effect of Participative leadership on the Relationship between Self-Efficacy and Knowledge Sharing

The data analysis indicates that the positive relationship between members' self-efficacy and knowledge sharing behavior increases with participative leadership behavior. The result supports the Path-Goal theory. An environment where leaders and followers are involved in a joint decision making and collaborative work-relevant matters will lead to higher self-efficacy and reduce the sense of powerlessness among followers (Huang, Iun, Liu, & Gong, 2010; Newman et al., 2018).

The Path-Goal theory proposes leaders to guide followers' by inspiring them to attain and accomplish goals (Northouse, 2016). Followers will be motivated by leaders who believe in their ability to perform their assigned work tasks. They will also be more motivated if they consider the work outcomes to be meaningful and appropriate (Vroom & Jago, 2007). This may induce followers' readiness to share their knowledge as participative leadership tends to foster the feeling of ''psychological ownership'' of followers (Li & Qian, 2016; Sashkin, 1976), increase followers feelings of self-efficacy and control, and reduce their sense of powerlessness (Arnold et al., 2000b).

Since most online programming communities are voluntary platforms, participative leadership behavior of a leader can motivate members to decide on their own creative and innovative way of contributing to the online programming communities. Members may share their expertise and programming skills that may inspire new ideas toward developing and enriching the functionality of the online programming communities. This type of leadership behavior by a virtual leader tend to foster the feeling of ''psychological ownership'' among followers (Li & Qian, 2016; Sashkin, 1976).

Practically, community managers and moderators motivate their members by paying special attention and giving their members a sense of ownership of the online programming community. Also, leaders can give the followers an opportunity to decide the direction of the community and create a free platform for the latter to work on.

It is worth noting that the findings of the current study have successfully established the interaction effect of participative leadership behavior on self-efficacy-knowledge sharing behavior. This is consistent with prior research that suggests that the participative behavior of leader plays a vital role in providing followers with intrinsic motivation, feelings of self-worth, and a sense of self-determination (Deci et al., 1989). This will increase the followers' willingness to share their knowledge.

Apart from that, leaders may motivate members by giving them the freedom to participate in any project they desire and by inducing trust among followers. Previous researches have recognized the relationship between knowledge sharing and participative leadership approaches. Participative leadership behavior allows experts and influential members from diverse ethnicities and backgrounds to collaborate and share their expertise and come up with new ideas of partnerships in the online programming community. A localized and common understanding may cause a cycle of more impactful community-based partnerships (Lucas, 2017).

Moving on, leaders with participative leadership skills enhance the autonomy, contribution, and involvement in the decision making of their members which increases knowledge sharing (Huang, Iun, Liu, & Gong, 2010). Participative leadership is a valuable practice for highly skilled face-to-face teams (Dionne, Sayama, Hao, & Bush, 2010). Also, online communities that are made of highly experienced and skilled professionals such as programmers work best in an environment that allows

contributions to decision-making, creativity, and goal setting within organizations (Lucas, 2017).

Overall, the findings of the current study have enriched the existing literature in the knowledge management research field. The result of this study emphasizes that participative leadership behavior increases members' self-efficacy and would positively enshrine and stimulate knowledge sharing behavior among the community members.

6.4.3 Moderating Effect of Achievement-Oriented Leadership on Relationship between Outcome Expectancy and Knowledge Sharing.

Another leadership behavior mentioned in the Path-Goal theory is achievement-oriented leadership. The current study hypothesized that the relationship between outcome expectancy and knowledge sharing will be moderated by achievement-oriented leadership in an online programming community. The finding supports the Path-Goal theory. This translates to the fact that a positive relationship between outcome expectancy and knowledge sharing behavior is amplified by leaders with high achievement-oriented leadership behavior. The result indicates a possible integration between SCT and Path-Goal theory, expanding the existing body of knowledge.

Individuals in online communities would share their knowledge when they expect to receive some positive outcomes that either physical or social. Individuals' level of willingness to share their knowledge would surge in a virtual environment with the presence of achievement-oriented leadership who play their role. This is because achievement-oriented leaders challenge followers to perform at the highest level possible to get a correspondent reward. This leader establishes a high standard of

excellence for followers and seeks continuous improvement. Achievement-oriented leaders demonstrate a confidence in followers in accomplishing challenging goals (Northouse, 2016).

Achievement-oriented leadership focuses on inspiring excellent performance among followers. This includes setting challenging goals, seeking improvement, ensuring excellence in performance, and displaying confidence on the ability of the followers (House R.J., 1996). Achievement-oriented leaders put higher pressure on members to perform at their best, achieve challenging goals and share their knowledge with others. These leaders may stimulate outcome expectancy towards knowledge sharing in online programming communities. Having leaders who can boost and strengthen members' capabilities on accomplishing challenging goals will increase the members' contribution towards online programming community. They will also be more willing to share their knowledge if they can expect reciprocal knowledge sharing from coworkers (Bock et al., 2005; Feng & Ye, 2016) or if they perceive their own knowledge needs and goals (Van den Hooff & de Leeuw van Weenen, 2004).

Previous studies indicated that the higher the expectancy and the more the person values the outcome, the more likely the behavior will occur (Butler et al., 2002; Chiu et al., 2006; Compeau et al., 1999; Hsu et al., 2007). The findings of the current study demonstrate that outcome expectancy could induce knowledge sharing in a virtual environment with a support from an achievement-oriented leader. This means that achievement-oriented leadership behavior can positively impact the relationship between outcome expectancy and knowledge sharing behavior.

Moving on, Butler et al. (2002) stated that the primary reason for individuals to share knowledge is their expectation of being seen as skilled, knowledgeable or to be

respected. In addition, previous online communities studies (Chiu et al., 2006; Dong et al., 2016; Feng & Ye, 2016; Wasko & Faraj, 2005) pointed out that if followers have strong expectations that they can improve their relationships with other members of the environment by offering knowledge, they will be more willing to share what they know with others (Chiu et al., 2006; Dong et al., 2016; Wasko & Faraj, 2005). These show that the presence of an achievement-oriented leader will enhance knowledge sharing among members.

Moreover, Hsiao and Chiou (2017) noted that the achievement-oriented leadership behavior is suitable when there are clear reward systems to serve as extrinsic motivation. This will also trigger intrinsic motivational needs of individuals to strive for satisfaction through higher performance. In online programming communities, achievement-oriented leadership can boost followers' motivation to attain specific external and internal rewards such as status in online programming community or gaining more stars and followers. This can be observed in many online communities such as Linux and gaming communities (Cashmore, Cleland, & Dixon, 2018; Ducheneaut, Moore, & Nickell, 2007; Jin et al., 2015). In addition, successfully accomplishing a challenging task, expansion of knowledge and network, and successfully guiding others to accomplish a task can create a sense of achievement as well. Therefore, an achievement-oriented environment will motivate members to contribute to goals completion, achieving online programming.

Moreover, the impact of achievement-oriented leadership is highly dependent on the achievement motivation of the members. Achievement motivation is an unconscious concern for personal rivalry against some standard of excellence and exceptional achievement (McClelland, 1985). Members who are highly achievement-motivated tend to have their own personal standards of achievement that may be very challenging

to others. They are self-motivated and are less likely to be influenced by others' entrustment of duty for accomplishment. They also pursue the set goals persistently and dynamically, they also take calculated risks, shoulder responsibility for goal accomplishment, envisage possible obstacles, create approaches for overcoming obstacles, pursue and make use of feedback.

The result of this study emphasizes that the positive relationship between outcome expectancy and knowledge sharing behavior becomes stronger in a virtual environment where there is achievement-oriented leadership. The result indicates a possible integration between SCT and Path-Goal theory, expanding the existing body of knowledge.

6.4.4 Moderating Effect of Directive Leadership on Relationship between Outcome Expectancy and Knowledge Sharing.

The fourth and the last leadership behavior in the Path-Goal theory is directive. In the current study, the relationship between outcome expectancy and knowledge sharing is hypothesized to be moderated by directive leadership in an online programming community. Nevertheless, the findings do not support the hypothesis. A possible reason is that directive leadership behavior is useful in handling inexperienced employees, but may backfire if implemented on highly professional individuals (Paquin et al., 2018; Rabbani et. al., 2017) or those with higher sense of efficiencies and competencies (Van Wart, 2017). This is because this type of leadership behavior could demotivate them to share their knowledge. Rabbani et al. (2017) asserted that directive leadership, although it has a consistent markup over job satisfaction, knowledge sharing and outcome expectancy, has a negative effect.

Apart from that, the rules and regulations imposed by this type of leadership behavior may limit the creation of creative ideas and new invention. Directive leadership will also prevent members' from choosing their own projects. As stated by Northouse (2016), directive leaders is a leader who imposes rules and regulation, gives followers instructions about their task, including what is expected of them, how to perform a task and scheduling and coordinating work by providing a timeline for when it should be completed. Members may feel restricted to provide their opinions and may gradually become reluctant to participate in knowledge sharing with their peers. These findings demonstrated that programmers would prefer an open environment where there can provide constructive criticism to each other without any prevention from the rules and regulations set by directive leaders.

Previous studies showed that directive leadership can guide followers to obey the rules and regulation and avoid conflict in the traditional organization. Nonetheless, the results demonstrate that directive leadership behavior will dampen the relationship between outcome expectancy and knowledge sharing. One possible reason is that most online programming communities are comprised of professionals, experts, and knowledgeable volunteers who may be uncomfortable with authoritative leaders. This brings a negative impact on the knowledge sharing behaviors among online programming community members.

6.5 Implications of the Study

All in all, this research has provided theoretical and practical contributions for academics and non-academics field. The following sub-sections discussed the contributions in detail.

6.5.1 Theoretical contributions

This study have integrate two theories together (Path-Goal theory and Social Cognitive theory) into one research model in assessing the factors that affect members' knowledge sharing behavior in online programming communities. In this study, the Path-Goal theory model is used as the basis to understand the correlation between followers' behavior and leadership behavior. This study then follows the main assumption of Social Cognitive theory of personal cognition to determine knowledge sharing related factors. Furthermore, self-efficacy and outcome expectancy is adopted to examine individuals' knowledge sharing. This thesis provides both theoretical and practical benefits to help fill this gap. The theoretical contribution is discussed in the following paragraph.

This study contributes to the current academic literature on knowledge sharing in online communities, and specifically in online programming communities. Firstly, this extends the current understanding of knowledge sharing by examining four leadership behaviors of a moderator/community manager and volunteer leaders. The theoretical underpinnings that ground these variables were based on the Path-Goal theory. In addition, personal cognitive factors are used as the building block in conceptualizing followers' characteristics toward knowledge sharing behavior. This was adopted from Social Cognitive theory and incorporated as followers' characteristics.

Moreover, this study provides insights into knowledge sharing behavior from four leadership behaviors in an online programming community. The integration of these four leadership behaviors (supportive, participative, achievement-oriented, and directive leadership) is important as it gives a more comprehensive understanding of the most influential determinant in online knowledge sharing context.

Apart from that, this research has demonstrate that the interaction of different leadership behavior of a leader provide different influences toward members considering members characteristics and task characteristics that demonstrates the importance of leadership in voluntary groups. This observation also calls for further studies on leaders' influence. Furthermore, personal cognitive has been shown to be a predictor towards continuing members' participation and contribution. The results in this study suggest that the three leadership behaviors studied in online programming communities are influential because of their ability to increase and develop members' personal cognition towards contributing their knowledge.

This study represents one type of online community of practice (OCOP) of programming practitioners out of dozens of other online communities of practice where the members usually share some common interests, background, and goals to participate and collectively contribute to the other online community of practice in sharing their knowledge.

Previous studies in various online communities have shown the influence of a leadership behaviour in different context. For instance, in a qualitative paper by Androulaki (2015) found that inspiring leadership of a role model in online beauty community increase members' self-confidence. In their study, supportive leadership is also demonstrated to have significant influence to members. The members feel more connected whenever their perceived leader responded through comments. The members are also more willing to be influenced and follows the leaders/ role model recommendations and advises in the future.

In congruent with this study, participative leadership is also demonstrated to influence members contribution in online health community (OHC) (Carron-Arthur et al. (2015))

. The leaders highlighted the best posts by members which later invite then inviting them to contribute to a community resource such as a newsletter. This shows a participative leadership of a leaders demonstrated in order to get members to be part of community building. Moreover, in a study of online social networking sites (MySpace) by Faraj et al. (2011), shows that perceived leaders can affect the mood of other members and generate increased collaboration by others via specific behaviors, exemplary participation and contribution. This study also support the findings of this study, which shows that leaders participative leadership increase members self-efficacy toward performing particular behavior.

It would be interesting to compare this finding with the studies in other types of virtual communities in future research due to the studies related to the knowledge sharing in online community of practice are considered limited (Cheung & Lee, 2007) compared to the academic investigations into knowledge sharing on practice-based organizational communities (Bock, Zmud, Kim, & Lee, 2005; Chai & Kim, 2010, 2012; Kankanhalli, Tan, & Wei, 2005; Ko, Kirsch, & King, 2005; Lu & Hsiao, 2007; Ma & Agarwal, 2007; Wasko & Faraj, 2005; Yang & Lai, 2011).

This study adds to the limited studies done with virtual communities of practitioners and allows future research to build on it. Apart from the theoretical contributions, the results of this study also provide some insights to online community practitioners and designers for building a sustainable virtual community where the findings of this study can be used to support other online communities that categories under Online Communities of Practice (OCP), such as online health community, online research communities, online engineers communities and online teachers communities, because there are many similar characteristics of these practitioners although practising different fields (Mojdeh, Head, & El Shamy, 2018). The leadership behaviour serve the purpose

by guiding online communities of practice members in increasing their self-efficacy and outcome expectancy toward knowledge sharing.

6.5.2 Implications for Practitioners

The findings of this study provide important implications for community managers and owners who use online programming communities as a platform for their members to share knowledge. With this knowledge, community managers and online programming communities' owners can understand: 1) the way that members evaluate their level of contribution through the guidance of four leadership examined, 2) how to encourage members' vision of their perceived expectancy when using online programming communities, 3) how to promote participation by having a strong belief on cooperative and committed environment.

In online communities, members are considered as recommendation agents. Therefore, having a mechanism to promote quality and fruitful discussions within the community is important. Since this study demonstrated outcome expectancy to influence knowledge sharing, introducing a reward mechanism to acknowledge a contribution may attract quality contributions from members. This is because members evaluate an online programming community by looking at its usefulness, reward system, personal gain, and other outcomes that may help them improve their own perception of their future contributions (Richter, Raban, & Rafaeli, 2015).

Apart from that, the results of this study also show that member's self-efficacy has a strong direct influence towards knowledge sharing behavior within the online programming communities. Online community owners and community managers can increase members' levels of self-efficacy by encouraging a safe participative community.

In addition, leaders can find a way to increase members' self-confidence and improve their self-perception. This may encourage continuous participation by the members (Tseng & Kuo, 2014). Encouraging the emergence of influential members also appears to provide positive benefits for overall participation, assuming that the influential members are promoting a positive environment. Therefore, monitor both the overall level and tone of participation.

Based on the findings, supportive leadership demonstrated a significant moderating influence on self-efficacy and knowledge sharing. Members' willingness to stay and participate in an online community is influenced by their leaders' encouragement and social support. Members will be reluctant to leave a community if they manage to establish a strong emotional bond with volunteer leaders and community managers. Therefore, to increase participation and contribution, online programming community managers/owners are encouraged to design strategies to promote the lasting relationship between members. An example of strategy is making use of the interactive chat rooms to communicate and discuss members' concerns related to technical and non-technical aspects with experts and influential programmers. One-to-one communication is useful as it can demonstrate the concern of leaders' in supporting their members' needs.

To increase members' participation, online community managers and owners are encouraged to work together with members to create a more enjoyable, compelling, and informative environment of online communities (Chiu et al., 2006). Integrating the use of skill-building challenges, network multimedia, and animation to deliver knowledge sharing experience within an online programming community will be useful. Furthermore, community managers can also engage members to participate in intellectual discourses by requesting experienced members to provide the community with the latest knowledge (Lam et al., 2015). This can lead to mutual sharing and

learning. Targeting influential members is also useful for technical and learning communities, especially since they tend to build relationships with their peers. Integrating discussion forums into everyday sharing and learning environments should increase the number of information delivered and consumed. Leaders of these groups are more likely to influence other members to share their knowledge, which can be an excellent extension for online programming communities.

Community owners/managers and group moderators can encourage or reward the behaviors of emerging leaders. An analysis of the interactions within the group over a set period of time would reveal which influential members would emerge as leaders. This will provide management insight into the talent pool and a chance for promotion. According to previous studies in an e-learning application, educators use these models to identify which students are leading their learning groups. This is because peer learning has been widely considered a powerful tool in education (Charlesworth, 2016). Apart from that, previous studies show that detecting and targeting student leaders early on and recognizing their leadership can help educators to better construct appropriate learning groups to encourage more participation (Chan, Bhandar, Oh, & Chan, 2004; Trust, Krutka, & Carpenter, 2016). All in all, recognizing the effort volunteered by active online community members will beget more participation.

Finally, the research created recommendation systems for loyal and experienced members to become part of the community managers' team. This can be done by welcoming them and fostering a sense of belonging to motivate greater participation (Thomas, Herbert, & Teras, 2014). Indirectly, these recommendations would serve as a reputation system to assist users in evaluating the content integrity and user status (Baker, Jensen, & Murphy, 1988). Members who are given the responsibility to take

charge will have an increase in self-efficacy as they know that their contributions are recognized and appreciated (Thomas et al., 2014).

6.5.3 Implications for System Designers

This study could help designers to develop and improve the design of online programming communities to maintain active and effective online communities.

For participative leadership behavior, this study suggests the integration of an online poll and online voting for administrators to obtain feedback and insights. They can also collect ideas and suggestions for new features directly from members. This feature will contribute to the creation and growth of online communities as it provides the members with the free will in discussing community issues, taking part in voting and community administration issues, and offering suggestions for community development. The online community is developed by voluntary participants and therefore it is necessary for these participants to be involved in the management and the coordination of the process. In addition, the community may add pages which are entirely devoted to members' opinions to suggest new features and complaints.

The most pressing issue in online communities are the 'free-riders'. This can be prevented by establishing a new feature of discussion groups that is called a "dedicated forum". In this group, members can delve into issues related to programming and assist other members to find a solution on developing and fixing bugs. This presents the "human side" of the community to its members that may encourage learning. System designers can also add programming languages assessment to evaluate the programming skills of a member. Programming skill level can also be published in members' profile to aid communication between members of different skill levels. After the assessment, it is essential to have lesson pages to educate members.

In addition, for achievement-oriented leaders, some features can be added to increase the outcome expectancy of members. The features suggested are establishing a reward system mechanism and ranking mechanism. This is because members with outcome expectancy characteristics need recognition from sharing their expertise on. Therefore, a system that can display one's individual contributions may encourage him to engage in the behavior more.

6.6 Limitation and Future Research Directions

This section discusses the theoretical and empirical limitations of this study. Based on the discussions, some directions for future research are proposed.

Research limitations refer to conditions beyond the control of the researcher that restrict the conclusions of the study and their application to other situations (Sekaran & Bougie, 2013). This study is limited because it only focused on the experiences of a selected number of people which participated in online programming communities.

This study represents one type of online community of practice (OCOP) of programming practitioners out of dozens of other online community of practice where the members usually share some common interests, background, and goals to participate and collectively contribute to the other online community of practice in sharing their knowledge. It would be interesting to compare this finding with the studies in other types of virtual communities in future research due to the studies related to the knowledge sharing in online community of practice are considered limited (Cheung & Lee, 2007) compared to the academic investigations into knowledge sharing on practice-based organizational communities (Bock, Zmud, Kim, & Lee, 2005; Chai & Kim, 2010, 2012; Kankanhalli, Tan, & Wei, 2005; Ko, Kirsch, & King, 2005; Lu & Hsiao, 2007; Ma & Agarwal, 2007; Wasko & Faraj, 2005; Yang & Lai, 2011).

This study adds to the limited studies done with virtual communities of practitioners and allows future research to build on it. Apart from the theoretical contributions, the results of this study also provide some insights to online community practitioners and designers for building a sustainable virtual community where the findings of this study can be used to support other online communities that categories under Online Communities of Practice (OCP), such as online health community, online research communities, online engineers communities and online teachers communities, because there are many similar characteristics of these practitioners although practising different fields (Mojdeh et al., 2018), following the definition of (Wenger & Snyder, 2000), that stated that community of practice is a group of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in the topic by interacting on an ongoing basis. Community of practice operate as "learning systems" or "actions system" where practitioners connect to solve problems, share ideas, set standards, build tools, and develop relationship with peers and stakeholder (Cruess, Cruess, & Steinert, 2018; Wenger & Snyder, 2000). The leadership behaviour serve the purpose by guiding online communities of practice members in increasing their self-efficacy and outcome expectancy toward knowledge sharing.

The participants of this research are selected through purposive sampling and only include current and active members of online programming communities from the top 20 programming languages listed in the TIOBE (The Coding Standard Company). This study was unable to reach members who have ceased participation in the online programming communities. Acquiring information from this group of members may be worthwhile because they may have different views on the impact of the proposed constructs on knowledge sharing behavior. Furthermore, the majority of the

respondents are from JavaScript and Python communities. Therefore, it is not clear whether the key findings of this study can be generalized to the online programming communities as a whole. Further verification of this research finding is highly encouraged.

In addition, this research focuses on the perception of respondents through a quantitative approach. Future studies may employ Social Network Analysis (SNA) to identify who are the leaders and examine their actual leadership behaviors. This could be done by investigating social structures using the networks visualization and signed graph. These materials can illustrate the real relationships that occur between members and the perceived leaders. They may also demonstrate the positive and negative relationships in the signed graph between online community members.

Further studies should analyze every function that can facilitate and engage members' knowledge sharing in the online community. Some of the functions that may contribute post/comments of online community tools are private chat and group chat functions, forum, lounge area, projects posting mechanism, and the design of online communities or any part of community applications that can facilitate and foster knowledge sharing.

Apart from that, future studies can also group the level of online programming community into beginner, intermediate, advanced, and expert. This classification allows researchers to observe how these four leadership behaviors can affect their personal cognition towards knowledge sharing in online programming communities based on their ranking status. This can also be done for levels of education or other different classification in online programming communities.

Moreover, the unit of analysis of this study is made on members individual level. Future researches may investigate the motivation of the leaders themselves by investigating

their perceptions with regards to what motivates leaders to guide and encourage other members to share their knowledge in online programming communities. This may provide information on the attributes possessed by the most influential members and make them the role model of the community. Consequently, this will facilitate knowledge sharing among the members.

The IT features in online communities should also be further assessed to analyze which features are most commonly used by the community members to interact with one another. This will engage the novel idea of improving or promoting said features to promote knowledge sharing. Apart from that, further inspection of these features may help us to understand if they have any correlation to motivate members to engage in knowledge sharing, or in contrast, these feature might have a possibility in hindering members knowledge sharing such as the blocking feature and feature for suspending members period of time from posting.

Finally, future researches should also aim to enhance the predictive power of the research model developed in this study. Perhaps, future studies can examine the impact of virtual leadership towards continuous knowledge sharing behavior to investigate if members constantly contributing to the online programming communities repositories.

6.7 Conclusion

This research has identified and evaluated personal cognitive factors and the moderating effect of leadership behaviors that influence members' knowledge sharing in online programming communities. A web survey is adapted to gather information from online programming community members to answer the research questions.

The study conducts a comprehensive literature review on the factors derived from related theories with a thorough examination of leadership, knowledge sharing, and online community domains. Based on the extensive literature review, four research questions were derived, six research hypotheses were generated, and a research model was developed.

The research model is significant as it explains 47.4% variance of members' knowledge sharing behavior within online programming communities. Furthermore, five out of six paths in the research model were found to be significant and support five hypothesized relationships.

Based on the research findings, a member's knowledge sharing behavior is influenced by their level of self-efficacy and perceived outcome expectancy. Three leadership behaviors – supportive leadership behavior, participative leadership behavior, and achievement-oriented leadership behavior – have significantly moderated the relationship between members' level of self-efficacy and outcome expectancy, and members' knowledge sharing behavior in online programming communities.

Given the fairly explanatory of the model, this study has significant theoretical and practical implications. This study provides a theoretical framework to examine the determinants of members' knowledge sharing behavior within online programming communities. The theory lies in extending the Path-Goal theory framework. Two constructs (self-efficacy and outcome expectancy) are incorporated as the followers' attributes. The further extension includes the positive moderated relationship of the three leadership behavior with personal cognitive factors and knowledge sharing behavior.

From a practical viewpoint, this study provides guidance to online programming communities' owners and managers. In general, the findings of this study can help online programming communities' owners and managers to understand: 1) how leadership supportive behavior and participative behavior influence members self-efficacy towards knowledge sharing behavior in online programming communities, 2) how leadership achievement-oriented behavior and directive behavior influence outcome expectancy of members towards knowledge sharing behavior in online communities, and 3) how to encourage members' belief of community and their outcome expectancy toward participating in contributing/responding/commenting to other members in online programming communities. Having a clear understanding of these determinants is important as it may assist in establishing online programming communities as a reference hub for technical aspects and members' opinions. It also provides opportunities for the community members to channel their ideas and suggestions in co-creating the feature of the community with the community manager.

References

Abouzahra, M., & Tan, J. (2014). *The Effect of Community Type on Knowledge Sharing Incentives in Online Communities: A Meta-analysis.* Paper presented at the Hawaii International Conference on System Science (HICSS).

Ahearne, M., Mathieu, J., & Rapp, A. (2005). To empower or not to empower your sales force? An empirical examination of the influence of leadership empowerment behavior on customer satisfaction and performance. *Journal of applied psychology, 90*(5), 945.

Ahmad, K. B., Ahmad, M., & Rejab, M. M. (2011). The influence of knowledge visualization on externalizing tacit knowledge. *International Journal on Advanced Science, Engineering and Information Technology, 1*(2), 124-128.

Ahn, S. J., Johnsen, K., Moore, J., Brown, S., Biersmith, M., & Ball, C. (2016). Using virtual pets to increase fruit and vegetable consumption in children: a technology-assisted social cognitive theory approach. *Cyberpsychology, Behavior, and Social Networking*, *19*(2), 86-92.

Akpotu, C. (2013). Transformational leadership and knowledge sharing in ICT based organizations in Nigeria. *International Journal of Business and Social Science, 4*(12).

Al-Husseini, S. J. (2014). *The Impact of Leadership Style on Innovation in Iraq's Higher Education Institutions: The Role of Knowledge Sharing* (Doctoral Dissertation), Plymouth University. Retrieved from http://hdl.handle.net/10026.1/3108 Available from Plymouth University

Alavi, M. (1994). Computer-mediated collaborative learning: An empirical evaluation. *MIS quarterly*, 159-174.

Alvesson, M., & Kärreman, D. (2016). Intellectual failure and ideological success in organization studies: The case of transformational leadership. *Journal of Management Inquiry, 25*(2), 139-152.

Andrews, D. C. (2002). Audience-specific online community design. *Communications of the ACM, 45*(4), 64-68.

Andrews, K. M., & Delahaye, B. L. (2000). Influences on knowledge processes in organizational learning: The psychosocial filter. *Journal of Management Studies, 37*(6), 797-810.

Angermeier, I., Dunford, B. B., Boss, A. D., & Boss, R. W. (2009). The impact of participative management perceptions on customer service, medical errors, burnout, and turnover intentions. *Journal of Healthcare Management*, *54*(2), 127.

Antonakis, J., Cianciolo, A. T., & Sternberg, R. J. (2004). Leadership: Past, present, and future. *The nature of leadership*, 3-15.

Apostolou, B., Belanger, F., & Schaupp, L. C. (2017). Online communities: satisfaction and continued use intention. *Information Research, 22*(4).

Arbabi, A., & Mehdinezhad, V. (2015). The relationship between the school principals' collaborative leadership style and teachers' self-efficacy. *Palestrica of the Third Millennium Civilization & Sport, 16*(2).

Arda, Ö. A., Aslan, T., & Alpkan, L. (2016). Review of practical implications in authentic leadership studies. *Procedia-Social and Behavioral Sciences, 229*, 246-252.

Ardichvili, A., Maurer, M., Li, W., Wentling, T., & Stuedemann, R. (2006). Cultural influences on knowledge sharing through online communities of practice. *Journal of Knowledge Management, 10*(1), 94-107.

Ardichvili, A., Page, V., & Wentling, T. (2003). Motivation and barriers to participation in virtual knowledge-sharing communities of practice. *Journal of Knowledge Management, 7*(1), 64-77.

Arguello, J., Butler, B. S., Joyce, E., Kraut, R., Ling, K. S., Rosé, C., & Wang, X. (2006). *Talk to me: foundations for successful individual-group interactions in online communities.* Paper presented at the Proceedings of the SIGCHI conference on Human Factors in computing systems.

Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of marketing research*, 396-402.

Arnold, J. A., Arad, S., Rhoades, J. A., & Drasgow, F. (2000a). The empowering leadership questionnaire: The construction and validation of a new scale for measuring leader behaviors. *Journal of Organizational Behavior, 21*(3), 249-269.

Arnold, J. A., Arad, S., Rhoades, J. A., & Drasgow, F. (2000b). The empowering leadership questionnaire: The construction and validation of a new scale for measuring leader behaviors. *Journal of Organizational Behavior*, 249-269.

Avolio, B. J. (1994). The "natural": Some antecedents to transformational leadership. *International Journal of Public Administration, 17*(9), 1559-1581.

Avolio, B. J. (2016). Introduction: The Golden Triangle for Examining Leadership Developmental Readiness. *New directions for student leadership, 2016*(149), 7-14.

Avolio, B. J., Walumbwa, F. O., & Weber, T. J. (2009). Leadership: Current theories, research, and future directions. *Annual review of psychology, 60*, 421-449.

Azanza, G., Moriano, J. A., Molero, F., & Lévy Mangin, J.-P. (2015). The effects of authentic leadership on turnover intention. *Leadership & Organization Development Journal, 36*(8), 955-971.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.

Bandura, A. (1989). Human agency in social cognitive theory. *American psychologist, 44*(9), 1175.

Bandura, A. (1994). Self-efficacy. In. VS Ramachaudran. *Encyclopedia of human behavior, 4*, 71-81.

Bandura, A. (1997a). Editorial. *American Journal of Health Promotion, 12*(1), 8-10.

Bandura, A. (1997b). Self-efficacy: The exercise of control: New York: Freeman. *17*(9), 1559-1581.

Barbuto, J., John, & Scroll, R. W. (1999). Leaders Motivation and Perception of Followers Motivation As Predictors of Influence Tactics Used. *Psychological Reports, 84*(3c), 1087-1098.

Barclay, D., Higgins, C., & Thompson, R. (1995). The partial least squares (PLS) approach to causal modeling: Personal computer adoption and use as an illustration. *Technology studies, 2*(2), 285-309.

Barling, J., & Beattie, R. (1983). Self-efficacy beliefs and sales performance. *Journal of Organizational Behavior Management, 5*(1), 41-51.

Barnett, V., & Lewis, T. (1994). Outliers in Statistical Data (Probability & Mathematical Statistics): Wiley. *15*(2), 195-210.

Bass, B. M. (1985). *Leadership and performance beyond expectations*: Collier Macmillan. *17*(9), 1559-1581.

Bass, B. M. (1991). From transactional to transformational leadership: Learning to share the vision. *Organizational dynamics, 18*(3), 19-31.

Bass, B. M. (1995). Comment: Transformational Leadership Looking at Other Possible Antecedents and Consequences. *Journal of Management Inquiry, 4*(3), 293-297.

Bass, B. M. (2008). Bass BM The Bass handbook of leadership: theory, research, and managerial applications 4th ed: New York: Free Press.

Bass, B. M., & Riggio, R. E. (2006). *Transformational leadership*: L. Erlbaum Associates. *17*(9), 1559-1581.

Baym, N. (2000). Tune In, Log on. Soaps, Fandom, and Online Com munity: London (UK): Sage Publications. BLACK, RW (2008). Adolescents and Online Fanfiction. New York (US): Peter Lang.

Beck, C. D. (2014). Antecedents of Servant Leadership A Mixed Methods Study. *Journal of Leadership & Organizational Studies*, 1548051814529993.

Bell, E., & Bryman, A. (2007). The ethics of management research: an exploratory content analysis. *British Journal of Management, 18*(1), 63-77.

Benkler, Y. (2006). *The wealth of networks: How social production transforms markets and freedom*: Yale University Press.

Bennis, W., & Nanus, B. (1985). The strategies for taking charge. *Leaders, New York: Harper. Row*. *36*(5), 64-65.

Blanchard, A. L., & Markus, M. L. (2004). The experienced sense of a virtual community: Characteristics and processes. *ACM Sigmis Database, 35*(1), 64-79.

Blumberg, B. F., Cooper, D. R., & Schindler, P. S. (2014). *Business research methods*: McGraw-hill education.

Bock, G.-W., & Kim, Y.-G. (2001). Breaking the myths of rewards: An exploratory study of attitudes about knowledge sharing. *Pacis 2001 proceedings*, 78.

Bock, G.-W., Zmud, R. W., Kim, Y.-G., & Lee, J.-N. (2005). Behavioral intention formation in knowledge sharing: Examining the roles of extrinsic motivators, social-psychological forces, and organizational climate. *MIS quarterly*, 87-111.

Bommer, W. H., Rubin, R. S., & Baldwin, T. T. (2004). Setting the stage for effective leadership: Antecedents of transformational leadership behavior. *The Leadership Quarterly*, *15*(2), 195-210.

Bonau, S. (2017). How to become an inspirational leader, and what to avoid. *Journal of Management Development, 36*(5), 614-625.

Bordia, P., Irmer, B., & Garden, A. (2004). Knolwedge Sharing In Response To A Supportive Work Environment : Evidence from an Australian *People, Knowledge and Technology: What Have We Learnt So Far?*, 129.

Bradshaw, R., Chebbi, M., & Oztel, H. (2015). Leadership and Knowledge Sharing. *Asian Journal of Business Research, 4*(3). doi:10.14707/ajbr.150001

Bruckman, A. S., Below, J. E., Dixon, L., Fiesler, C., Gilbert, E. E., Gilbert, S. A., & Matias, J. N. (2018). *Managing Deviant Behavior in Online Communities III.* Paper presented at the Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems.

Bryant, S. E. (2003). The role of transformational and transactional leadership in creating, sharing and exploiting organizational knowledge. *Journal of Leadership & Organizational Studies*, *9*(4), 32-44.

Bryman, A. (2015). *Social research methods*: Oxford university press.

Butler, B., Sproull, L., Kiesler, S., & Kraut, R. (2002). Community effort in online groups: Who does the work and why. *Leadership at a distance: Research in technologically supported work*, 171-194.

Cabrera, A., & Cabrera, E. F. (2002). Knowledge-sharing dilemmas. *Organization studies*, *23*(5), 687-710.

Cabrera, A., Collins, W. C., & Salgado, J. F. (2006). Determinants of individual engagement in knowledge sharing. *The International Journal of Human Resource Management, 17*(2), 245-264.

Cacioppe, R. (2000). Creating spirit at work: Re-visioning organization development and leadership-Part I. *Leadership & Organization Development Journal, 21*(1), 48-54.

Çakıroğlu, Ü., Kokoç, M., Kol, E., & Turan, E. (2016). Exploring teaching programming online through web conferencing system: The lens of activity theory. *Journal of Educational Technology & Society, 19*(4), 126-139.

Carron-Arthur, B., Ali, K., Cunningham, J. A., & Griffiths, K. M. (2015). From help-seekers to influential users: a systematic review of participation styles in online health communities. *Journal of medical Internet research, 17*(12), e271.

Carson, J. B., Tesluk, P. E., & Marrone, J. A. (2007). Shared leadership in teams: An investigation of antecedent conditions and performance. *Academy of management Journal, 50*(5), 1217-1234.

Carton, A. M., & Lucas, B. J. (2018). How can leaders overcome the blurry vision bias? Identifying an antidote to the paradox of vision communication. *Academy of management Journal, 61*(6), 2106-2129.

Cashmore, E., Cleland, J., & Dixon, K. (2018). Gaming and Gambling *Screen Society* (pp. 151-167): Springer.

Cegarra-Navarro, J.-G., & Cepeda-Carrión, G. (2010). How to implement a knowledge management program in hospital-in-the-home units. *Leadership in Health Services, 23*(1), 46-56.

Certo, S. C., & Certo, S. T. (2006). Modern Management 10e: Upper Saddle River: Pearson Education, Inc.

Chan, C. M. L., Bhandar, M., Oh, L.-B., & Chan, H.-C. (2004). *Recognition and participation in a virtual community.* Paper presented at the System Sciences, 2004. Proceedings of the 37th Annual Hawaii International Conference on.

Chang, Y.-S., Hsu, S.-F., Liao, C.-H., & Lin, S.-C. (2013). *Knowledge sharing in online communities: Subjective norm, trust, media richness, and the individual's role in knowledge sharing.* Paper presented at the World Conference on Educational Media and Technology.

Charlesworth, Z. M. (2016). *The Classroom Community: Digital Technology in Support of Collaborative Learning in Higher Education.* Paper presented at the Global Learn.

Chatterjee, S., & Yilmaz, M. (1992). A review of regression diagnostics for behavioral research. *Applied Psychological Measurement, 16*(3), 209-227.

Chavis, D. M., Hogge, J. H., McMillan, D. W., & Wandersman, A. (1986). Sense of community through Brunswik's lens: A first look. *Journal of community psychology, 14*(1), 24-40.

Cherian, J., & Jacob, J. (2013). Impact of self efficacy on motivation and performance of employees. *International Journal of Business and Management, 8*(14), 80.

Cheung, C. M., Lee, M. K., & Lee, Z. W. (2013). Understanding the continuance intention of knowledge sharing in online communities of practice through the post-knowledge-sharing evaluation processes. *Journal of the American Society for Information Science and Technology, 64*(7), 1357-1374.

Chih, Y.-Y., Kiazad, K., Cheng, D., Emamirad, E., & Restubog, S. L. (2018). Interactive Effects of Supportive Leadership and Top Management Team's Charismatic Vision in Predicting Worker Retention in the Philippines. *Journal of Construction Engineering and Management, 144*(10), 04018095.

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern methods for business research, 295*(2), 295-336.

Chin, W. W. (2010). How to write up and report PLS analyses Handbook of partial least squares (pp. 655-690). *Berlin: Springer, 10*, 978-973.

Chin, W. W., Marcolin, B. L., & Newsted, P. R. (2003). A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study. *Information Systems Research, 14*(2), 189-217.

Chiu, C.-M., Hsu, M.-H., & Wang, E. T. (2006). Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision Support Systems, 42*(3), 1872-1888.

Choi, N., Chengalur-Smith, I., & Nevo, S. (2015). Loyalty, ideology, and identification: An empirical study of the attitudes and behaviors of passive users of open source software. *Journal of the Association for Information Systems, 16*(8), 674.

Choi, S. B., Tran, T. B. H., & Park, B. I. (2015). Inclusive leadership and work engagement: Mediating roles of affective organizational commitment and creativity. *Social Behavior and Personality: an international journal, 43*(6), 931-943.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences 2nd edn: Erlbaum Associates, Hillsdale. *4*(4), 29-32.

Collier, B., & Kraut, R. (2012). Leading the collective: social capital and the development of leaders in core-periphery organizations. *arXiv preprint arXiv:1204.3682*.

Combs, G. M., & Luthans, F. (2007). Diversity training: Analysis of the impact of self-efficacy. *Human Resource Development Quarterly, 18*(1), 91-120.

Compeau, D., Higgins, C. A., & Huff, S. (1999). Social cognitive theory and individual reactions to computing technology: A longitudinal study. *MIS quarterly*, 145-158.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS quarterly*, 189-211.

Conger, J. A., & Kanungo, R. N. (1988). The empowerment process: Integrating theory and practice. *Academy of management Review, 13*(3), 471-482.

Connelly, C. E., & Kevin Kelloway, E. (2003). Predictors of employees' perceptions of knowledge sharing cultures. *Leadership & Organization Development Journal, 24*(5), 294-301.

Conway, J. M., & Lance, C. E. (2010). What reviewers should expect from authors regarding common method bias in organizational research. *J Bus Psychol, 25*(3), 325-334.

Corrado, Anthony, & Firestone, C. M. (1996). *Elections in cyberspace: Towards a new era in American politics*: Aspen Inst Human Studies.

Cramer, D. (2003). *Fundamental statistics for social research: step-by-step calculations and computer techniques using SPSS for Windows*: Routledge.

Creed, A. S. (2009). Action research of cyclonic transactions in online management education.

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*: Sage publications.

Cummings, J. N., Butler, B., & Kraut, R. (2002). The quality of online social relationships. *Communications of the ACM, 45*(7), 103-108.

Dabbish, L., Farzan, R., Kraut, R., & Postmes, T. (2012). *Fresh faces in the crowd: turnover, identity, and commitment in online groups.* Paper presented at the Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work.

Dahlander, L., & Frederiksen, L. (2012). The core and cosmopolitans: A relational view of innovation in user communities. *Organization science, 23*(4), 988-1007.

Davenport, T. H., & Prusak, L. (1998). *Working knowledge: How organizations manage what they know*: Harvard Business Press.

Dawson, J. F. (2014). Moderation in management research: What, why, when, and how. *J Bus Psychol, 29*(1), 1-19.

Deci, E. L., Connell, J. P., & Ryan, R. M. (1989). Self-determination in a work organization. *Journal of applied psychology, 74*(4), 580.

Deluga, R. J. (1998). Leader-member exchange quality and effectiveness ratings the role of subordinate-supervisor conscientiousness similarity. *Group & Organization Management, 23*(2), 189-216.

Derue, D. S., Nahrgang, J. D., Wellman, N., & Humphrey, S. E. (2011). Trait and behavioral theories of leadership: An integration and meta-analytic test of their relative validity. *Personnel psychology, 64*(1), 7-52.

Dessler, G., & Starke, F. A. (2004). *Management: principles and practices for tomorrow's leaders*: Pearson/Prentice Hall.

Dijkstra, T. (1983). Some comments on maximum likelihood and partial least squares methods. *Journal of Econometrics, 22*(1-2), 67-90.

Dinh, J. E., Lord, R. G., Gardner, W. L., Meuser, J. D., Liden, R. C., & Hu, J. (2014). Leadership theory and research in the new millennium: Current theoretical trends and changing perspectives. *The Leadership Quarterly, 25*(1), 36-62.

DiSalvo, B. B. M. B. (2014). *Khan academy gamifies computer science.* Paper presented at the Proc. 45th ACM Techn. Symp. Comput. Sci. Educ.

Doane, D. P., & Seward, L. E. (2011). Measuring skewness: a forgotten statistic? *Journal of Statistics Education, 19*(2).

Donate, M. J., & Sánchez de Pablo, J. D. (2015). The role of knowledge-oriented leadership in knowledge management practices and innovation. *Journal of Business Research, 68*(2), 360-370. doi:10.1016/j.jbusres.2014.06.022

Dong, T.-P., Dong, T.-P., Hung, C.-L., Hung, C.-L., Cheng, N.-C., & Cheng, N.-C. (2016). Enhancing knowledge sharing intention through the satisfactory context of continual service of knowledge management systems. *Information Technology & People, 29*(4), 807-829.

Dowling, M., & Rickwood, D. (2016). Exploring hope and expectations in the youth mental health online counselling environment. *Computers in Human Behavior, 55*, 62-68.

Duarte, P. A. O., & Raposo, M. L. B. (2010). A PLS model to study brand preference: An application to the mobile phone market *Handbook of partial least squares* (pp. 449-485): Springer.

Ducheneaut, N., Moore, R. J., & Nickell, E. (2007). Virtual "third places": A case study of sociability in massively multiplayer games. *Computer Supported Cooperative Work (CSCW), 16*(1-2), 129-166.

Ducheneaut, N., Yee, N., Nickell, E., & Moore, R. J. (2007). *The life and death of online gaming communities: a look at guilds in world of warcraft.* Paper presented at the Proceedings of the SIGCHI conference on Human factors in computing systems.

Duncan-Howell, J. (2007). Online communities of practice and their role in the professional development of teachers.

Eisenbeiß, S. A., & Boerner, S. (2010). Transformational leadership and R&D innovation: taking a curvilinear approach. *Creativity and Innovation Management*, *19*(4), 364-372.

Elliott, A. C., & Woodward, W. A. (2007). *Statistical analysis quick reference guidebook: With SPSS examples*: Sage.

Ellis, J., Brown, K., Ramsay, S., & Falk, J. (2016). Social Cognitive Theory-Based Cooking Program for Student-Athletes' Healthy Food Choices and Food Preparation Self-Efficacy. *Journal of Nutrition Education and Behavior*, *48*(7), S26.

Evans, P., & Wurster, T. S. (1999). Getting real about virtual commerce. *Harvard Business Review*, *77*, 84-98.

Facebook. (2018). Introducing Moderators in Groups. Retrieved from https://www.facebook.com/help/community/question/?id=282017445468428

Falk, R. F., & Miller, N. B. (1992). *A primer for soft modeling*: University of Akron Press.

Faraj, S., Jarvenpaa, S. L., & Majchrzak, A. (2011). Knowledge collaboration in online communities. *Organization science*, *22*(5), 1224-1239.

Faraj, S., Kudaravalli, S., & Wasko, M. M. (2015). Leading Collaboration in Online Communities. *MIS quarterly*, *39*(2), 393-412.

Fararah, F. S., & Al-Swidi, A. K. (2013). The role of the perceived benefits on the relationship between service quality and customer satisfaction: a study on the Islamic microfinance and SMEs in Yemen using PLS approach. *Asian Social Science*, *9*(10), 18.

Farid, H., Davaji, J. G., & Barani, G. (2016). The Relationship between Transformational Leadership and Knowledge Sharing in Employees of Golestan University of Medical Sciences. *Research Journal of Management Reviews. Vol*, *2*(6), 332-335.

Fausing, M. S., Joensson, T. S., Lewandowski, J., & Bligh, M. (2015). Antecedents of shared leadership: empowering leadership and interdependence. *Leadership & Organization Development Journal*, *36*(3), 271-291.

Fernet, C., Trépanier, S.-G., Austin, S., Gagné, M., & Forest, J. (2015). Transformational leadership and optimal functioning at work: On the mediating role of employees' perceived job characteristics and motivation. *Work & Stress*, *29*(1), 11-31.

Feng, Y., & Ye, H. J. (2016). Why do you return the favor in online knowledge communities? A study of the motivations of reciprocity. *Computers in Human Behavior*, *63*, 342-349.

Flynn, C. B., Smither, J. W., & Walker, A. G. (2016). Exploring the relationship between leaders' core self-evaluations and subordinates' perceptions of servant leadership: a field study. *Journal of Leadership & Organizational Studies, 23*(3), 260-271.

Ford, D., Smith, J., Guo, P. J., & Parnin, C. (2016). *Paradise unplugged: Identifying barriers for female participation on stack overflow.* Paper presented at the Proceedings of the 2016 24th ACM SIGSOFT International Symposium on Foundations of Software Engineering.

Fornell, C., & Larcker, D. F. (1994). Partial least Squares. Advanced methods of marketing researach. Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research,* 39-50.

Foucault, M., Palyart, M., Blanc, X., Murphy, G. C., & Falleri, J.-R. (2015). *Impact of developer turnover on quality in open-source software.* Paper presented at the Proceedings of the 2015 10th Joint Meeting on Foundations of Software Engineering.

Freeman, H., Patel, D., Routen, T., Ryan, S., & Scott, B. (2013). *The virtual university: The internet and resource-based learning*: Routledge.

Fullwood, R., Rowley, J., & Delbridge, R. (2013). Knowledge sharing amongst academics in UK universities. *Journal of Knowledge Management, 17*(1), 123-136.

Galehbakhtiari, S. (2015). A hermeneutic phenomenological study of online community participation: Applications of Fuzzy Cognitive Maps. *Computers in Human Behavior, 48,* 637-643.

Gamo-Sanchez, A.-L., & Cegarra-Navarro, J.-G. (2015). Factors that influence the success of a KM-program in a small-sized airport. *Journal of Knowledge Management, 19*(3), 593-610.

Garavan, T., Watson, S., Carbery, R., & O'Brien, F. (2015). The antecedents of leadership development practices in SMEs: The influence of HRM strategy and practice. *International Small Business Journal*, 0266242615594215.

Gawaza, S. I. (2016). *An Assessment of the Effects of Head Teachers' Leadership Styles on Teachers' Job Performance in Selected Primary Schools in Dar es Salaam.* The Open University of Tanzania.

Geisser, S. (1974). A predictive approach to the random effect model. *Biometrika, 61*(1), 101-107.

George, B., & McLean, A. (2007). Why leaders lose their way. *Strategy & leadership, 35*(3), 4-11.

Ghauri, P., & Gronhaugh, K. (2010). Research Methods in Business Studies. 4. painos. *Essex: Pearson Education Limited*, 977-979.

Ghobadi, S., & Mathiassen, L. (2016). Perceived barriers to effective knowledge sharing in agile software teams. *Information Systems Journal, 26*(2), 95-125.

Gorry, G. A., & Westbrook, R. A. (2009). Winning the internet confidence game. *Corporate Reputation Review, 12*(3), 195-203.

Grams, W. C., & Rogers, R. W. (1990). Power and personality: Effects of Machiavellianism, need for approval, and motivation on use of influence tactics. *The Journal of General Psychology, 117*(1), 71-82.

Gray, B. (2004). Informal learning in an online community of practice. *Journal of Distance Education, 19*(1), 20.

Groves, R. M. (2006). Nonresponse rates and nonresponse bias in household surveys. *Public opinion quarterly, 70*(5), 646-675.

Guay, F., Chanal, J., Ratelle, C. F., Marsh, H. W., Larose, S., & Boivin, M. (2010). Intrinsic, identified, and controlled types of motivation for school subjects in young elementary school children. *British Journal of Educational Psychology, 80*(4), 711-735.

Haenlein, M., & Kaplan, A. M. (2004). A beginner's guide to partial least squares analysis. *Understanding statistics, 3*(4), 283-297.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). Multivariate data analysis 6th ed. *Uppersaddle River: Pearson Prentice Hall*.

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., & Thiele, K. O. (2017). Mirror, mirror on the wall: a comparative evaluation of composite-based structural equation modeling methods. *Journal of the academy of marketing science, 45*(5), 616-632.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing theory and Practice, 19*(2), 139-152.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modeling: Rigorous applications, better results and higher acceptance.

Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the academy of marketing science, 40*(3), 414-433.

Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modeling (PLS-SEM)*: Sage Publications.

Hamilton, R., Scott, D., LaChapelle, D., & O'Sullivan, L. (2016). Applying Social Cognitive Theory to Predict Hazing Perpetration in University Athletics. *Journal of Sport Behavior, 39*(3), 255.

Han, J. H., Bartol, K. M., & Kim, S. (2015). Tightening up the performance–pay linkage: Roles of contingent reward leadership and profit-sharing in the cross-level influence of individual pay-for-performance. *Journal of applied psychology, 100*(2), 417.

Hara, N., & Foon Hew, K. (2007). Knowledge-sharing in an online community of health-care professionals. *Information Technology & People, 20*(3), 235-261.

Harvey, J. H., & Pauwels, B. G. (2009). 36 Relationship Connection: A Redux on the Role of Minding and the Quality of Feeling Special in the Enhancement of Closeness. *The Oxford handbook of positive psychology*, 385.

Hashim, K. F., & Tan, F. B. (2015). The mediating role of trust and commitment on members' continuous knowledge sharing intention: A commitment-trust theory perspective. *International Journal of Information Management, 35*(2), 145-151.

Heise, D., & George, W. (1970). Validity, invalidity, and reliability, sociological methodology. *San Francisco, CA: Jossey-Bess Publishers*.

Helm, S., Eggert, A., & Garnefeld, I. (2010). Modeling the impact of corporate reputation on customer satisfaction and loyalty using partial least squares *Handbook of partial least squares* (pp. 515-534): Springer.

Henseler, J. (2010). On the convergence of the partial least squares path modeling algorithm. *Computational statistics, 25*(1), 107-120.

Henseler, J., & Chin, W. W. (2010). A comparison of approaches for the analysis of interaction effects between latent variables using partial least squares path modeling. *Structural Equation Modeling, 17*(1), 82-109.

Henseler, J., & Fassott, G. (2010). Testing moderating effects in PLS path models: An illustration of available procedures *Handbook of partial least squares* (pp. 713-735): Springer.

Henseler, J., Fassott, G., Dijkstra, T. K., & Wilson, B. (2012). Analysing quadratic effects of formative constructs by means of variance-based structural equation modelling. *European Journal of Information Systems, 21*(1), 99-112.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science, 43*(1), 115-135.

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. *Advances in international marketing, 20*(1), 277-319.

Henseler, J., Wilson, B., Götz, O., & Hautvast, C. (2007). Investigating the moderating role of fit on sports sponsorship and brand equity. *International Journal of Sports Marketing and Sponsorship, 8*(4), 34-42.

Hertel, G., Geister, S., & Konradt, U. (2005). Managing virtual teams: A review of current empirical research. *Human Resource Management Review, 15*(1), 69-95.

Hew, K. F., & Hara, N. (2006). Identifying factors that encourage and hinder knowledge sharing in a longstanding online community of practice. *Journal of Interactive Online Learning, 5*(3), 297-316.

Hew, K. F., & Hara, N. (2007). Knowledge sharing in online environments: A qualitative case study. *Journal of the American Society for Information Science and Technology, 58*(14), 2310-2324.

Hildreth, P., Kimble, C., & Wright, P. (2000). Communities of practice in the distributed international environment. *Journal of Knowledge Management, 4*(1), 27-38.

Hinton, P. R., McMurray, I., & Brownlow, C. (2004). *SPSS explained*: Routledge.

Hirt, M. J. K. (2016). Path-Goal Theory of Leadership: Leadership and Public Management. *Global Encyclopedia of Public Administration, Public Policy, and Governance*, 1-6.

Hoch, J. E., Pearce, C. L., & Welzel, L. (2010). Is the most effective team leadership shared? *Journal of Personnel Psychology*. *55*, 62-68

Holden, M. T., & Lynch, P. (2004). Choosing the appropriate methodology: understanding research philosophy. *The marketing review, 4*(4), 397-409.

Horrigan, J. (2001). *Online communities: Networks that nurture long-distance relationships and local ties*: Pew Internet & American Life Project. 5(7), 28-45

House, R. J. (1971). A path goal theory of leader effectiveness. *Administrative science quarterly*, 321-339.

House, R. J. (1996). Path-goal theory of leadership: Lessons, legacy, and a reformulated theory. *The Leadership Quarterly, 7*(3), 323-352.

Hsiao, C.-C., & Chiou, J.-S. (2017). The social influence of online collaborative community: the moderating effect of achievement. *Behaviour & Information Technology, 36*(3), 269-280.

Hsu, M.-H., & Chiu, C.-M. (2004). Internet self-efficacy and electronic service acceptance. *Decision Support Systems, 38*(3), 369-381.

Hsu, M.-H., Ju, T. L., Yen, C.-H., & Chang, C.-M. (2007). Knowledge sharing behavior in virtual communities: The relationship between trust, self-efficacy, and outcome expectations. *International journal of human-computer studies, 65*(2), 153-169.

Hu, M., Lim, E.-P., Lim, E.-P., Sun, A., Lauw, H. W., & Vuong, B.-Q. (2007). *Measuring article quality in wikipedia: models and evaluation.* Paper presented

at the Proceedings of the sixteenth ACM conference on Conference on information and knowledge management.

Huang, L.-C., Ting, I.-H., & Chou, S.-C. T. (2014). The key factors of knowledge sharing in online community *Learning Technology for Education in Cloud. MOOC and Big Data* (pp. 105-113): Springer.

Huang, Q., Davison, R. M., Liu, H., & Gu, J. (2009). The impact of leadership style on knowledge sharing intentions in China. *Technological Advancement in Developed and Developing Countries: Discoveries in Global Information Management: Discoveries in Global Information Management*, 174.

Huang, X., Iun, J., Liu, A., & Gong, Y. (2010). Does participative leadership enhance work performance by inducing empowerment or trust? The differential effects on managerial and non-managerial subordinates. *Journal of Organizational Behavior, 31*(1), 122-143.

Huey Yiing, L., & Zaman Bin Ahmad, K. (2009). The moderating effects of organizational culture on the relationships between leadership behaviour and organizational commitment and between organizational commitment and job satisfaction and performance. *Leadership & Organization Development Journal, 30*(1), 53-86.

Huffaker, D., & Lai, J. (2007). *Motivating online expertise-sharing for informal learning: The influence of age and tenure in knowledge organizations.* Paper presented at the Advanced Learning Technologies, 2007. ICALT 2007. Seventh IEEE International Conference on.

Imtiaz, S., & Ahmad, S. (2009). Impact of stress on employee productivity, performance and turnover; an important managerial issue. *International Review of Business Research Papers*, *5*(4), 468-477.

Indvik, J. (1986). A Path-Goal Theory Investigation Of Superior-Subordinate Relationships (Leadership, Downward Communication, Supervision, Organizational).

Ipe, M. (2003). Knowledge sharing in organizations: A conceptual framework. *Human resource development review, 2*(4), 337-359.

Jemielniak, D. (2015). Naturally emerging regulation and the danger of delegitimizing conventional leadership: Drawing on the example of Wikipedia. *The SAGE Handbook of Action Research. London, UK—New Delphi, India—Thousand Oaks, CA: Sage.*

Jin, J., Li, Y., Zhong, X., & Zhai, L. (2015). Why users contribute knowledge to online communities: An empirical study of an online social Q&A community. *Information & Management, 52*(7), 840-849.

Johnson, R. D., & Marakas, G. M. (2000). Research report: the role of behavioral modeling in computer skills acquisition: toward refinement of the model. *Information Systems Research, 11*(4), 402-417.

Johnson, S. L. (2008). Impact of leadership on continued participation in online groups. *Information Systems Research. 55*, 62-68

Johnson, S. L., Safadi, H., & Faraj, S. (2015). The Emergence of Online Community Leadership. *Information Systems Research, 26*(1), 165-187. doi:10.1287/isre.2014.0562

Jones, J. (2008). Patterns of revision in online writing a study of Wikipedia's featured articles. *Written communication, 25*(2), 262-289.

Joseph, F., Hair, J., Black, W., Babin, B., & Anderson, R. (2010). Multivariate data analysis: a global perspective (7th (Global Edition) ed.): United States: Prentice Hall.

Kankanhalli, A., Tan, B. C., & Wei, K.-K. (2005). Contributing knowledge to electronic knowledge repositories: an empirical investigation. *MIS quarterly*, 113-143.

Kaufman, H. F. (1959). Toward an interactional conception of community. *Soc. F., 38*, 8.

Kegan, R. (1982). *Evolving Self*: Harvard University Press.

Kelloway, E. K., & Gilbert, S. (2017). Does It Matter Who Leads Us?: The Study of Organizational Leadership. *An Introduction to Work and Organizational Psychology: An International Perspective*, 192-211.

Kenny, D. A., & Judd, C. M. (1984). Estimating the nonlinear and interactive effects of latent variables. *Psychological Bulletin, 96*(1), 201.

Kiesler, S., Kraut, R., Resnick, P., & Kittur, A. (2012). Regulating behavior in online communities. *Building Successful Online Communities: Evidence-Based Social Design. MIT Press, Cambridge, MA*.

Kim, S., & Lee, H. (2006). The impact of organizational context and information technology on employee knowledge-sharing capabilities. *Public Administration Review, 66*(3), 370-385.

Kimble, C., Hildreth, P., & Wright, P. (2001). Communities of practice: going virtual. *Knowledge management and business model innovation*, 220-234.

Kirkpatrick, S. A., & Locke, E. A. (1996). Direct and indirect effects of three core charismatic leadership components on performance and attitudes. *Journal of applied psychology, 81*(1), 36.

Kline, R. (2011). Principles and Practice of Structural Equation Modeling, 3rd edn Guilford Press. *New York*.

Koh, J., & Kim, Y.-G. (2004). Knowledge sharing in virtual communities: an e-business perspective. *Expert systems with applications, 26*(2), 155-166.

Kolekofski Jr, K. E., & Heminger, A. R. (2003). Beliefs and attitudes affecting intentions to share information in an organizational setting. *Information & Management, 40*(6), 521-532.

Kollock, P. (1999). The economies ol online cooperation. *Communities in cyberspace, 220*.

Kondratova, I., & Goldfarb, I. (2004). Virtual communities of practice: Design for collaboration and knowledge creation.

Kononenko, O., Baysal, O., & Godfrey, M. W. (2016). *Code review quality: how developers see it.* Paper presented at the Software Engineering (ICSE), 2016 IEEE/ACM 38th International Conference on.

Koopman, P., & Wierdsma, A. (1998). Participative management. *Personnel psychology: Handbook of work and organizational psychology, 3*, 297-324.

Kothari, C. R. (2004). *Research methodology: Methods and techniques*: New Age International.

Kouzes, R. T., Myers, J. D., & Wulf, W. A. (1996). Collaboratories: Doing science on the Internet. *Computer, 29*(8), 40-46.

Kraut, A. (2010). " Stealing Steps" and Signature Moves: Embodied Theories of Dance as Intellectual Property. *Theatre Journal, 62*(2), 173-189.

Kristensen, K., & Eskildsen, J. (2010). Design of PLS-based satisfaction studies *Handbook of partial least squares* (pp. 247-277): Springer.

Kuhn, K. M., & Yockey, M. D. (2003). Variable pay as a risky choice: Determinants of the relative attractiveness of incentive plans. *Organizational behavior and human decision processes, 90*(2), 323-341.

Kumar, M., Talib, S. A., & Ramayah, T. (2013). *Business research methods*: Oxford Fajar/Oxford University Press.

La Rocco, J. M., & Jones, A. P. (1978). Co-worker and leader support as moderators of stress-strain relationships in work situations. *Journal of applied psychology, 63*(5), 629.

Lai, H.-M., & Chen, T. T. (2014). Knowledge sharing in interest online communities: A comparison of posters and lurkers. *Computers in Human Behavior, 35*, 295-306.

Lakhani, K. R., & Von Hippel, E. (2003). How open source software works:"free" user-to-user assistance. *Research policy, 32*(6), 923-943.

Lam, A., & Lambermont-Ford, J.-P. (2010). Knowledge sharing in organisational contexts: a motivation-based perspective. *Journal of Knowledge Management, 14*(1), 51-66.

Lam, C. K., Huang, X., & Chan, S. C. (2015). The threshold effect of participative leadership and the role of leader information sharing. *Academy of management Journal, 58*(3), 836-855.

Lam, J., & Lee, M. (2005). *Bridging the digital divide-The roles of Internet self-efficacy towards learning computer and the Internet among elderly in Hong Kong, China.* Paper presented at the Proceedings of the 38th annual Hawaii international conference on system sciences.

Lampe, C., Obar, J., Ozkaya, E., Zube, P., & Velasquez, A. (2012). *Classroom Wikipedia participation effects on future intentions to contribute.* Paper presented at the Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work.

Latham, J. R. (2014). Leadership for quality and innovation: Challenges, theories, and a framework for future research. *Quality Management Journal, 21*(1), 11-15.

Leach, D. J., Wall, T. D., & Jackson, P. R. (2003). The effect of empowerment on job knowledge: An empirical test involving operators of complex technology. *Journal of Occupational and Organizational Psychology, 76*(1), 27-52.

Lechner, S. (1998). Teachers of the N-Gen Need Reflective Online Communities (And So Do the Teachers of Teachers). *Journal of Online Learning, 9*(3), 20-23.

Lee, C. K., & Al-Hawamdeh, S. (2002). Factors impacting knowledge sharing. *Journal of Information & Knowledge Management, 1*(01), 49-56.

Lee, C. K., Foo, S., Chaudhry, A. S., & Hawamdeh, S. (2004). *Developing a theory of voluntary, informal, knowledge sharing.* Paper presented at the Proceeding of the International Conference on Knowledge, Culture, and Change in Organization, London, UK, August.

Lee, L., Petter, S., Fayard, D., & Robinson, S. (2011). On the use of partial least squares path modeling in accounting research. *International Journal of Accounting Information Systems, 12*(4), 305-328.

Lee, P., Gillespie, N., Mann, L., & Wearing, A. (2010). Leadership and trust: Their effect on knowledge sharing and team performance. *Management Learning*.

Leenders, R. T. A. (2002). Modeling social influence through network autocorrelation: constructing the weight matrix. *Social Networks, 24*(1), 21-47.

Leithwood, K., Jantzi, D., & Steinbach, R. (1999). *Changing leadership for changing times*: McGraw-Hill Education (UK).

Lesser, E. L. (2000). Leveraging social capital in organizations. *Knowledge and social capital: Foundations and applications, 3*, 16.

Lewis, B. R., Templeton, G. F., & Byrd, T. A. (2005). A methodology for construct development in MIS research. *European Journal of Information Systems, 14*(4), 388-400.

Li, W. (2009). Online knowledge sharing among Chinese and American employees: Explore the influence of national cultural differences. *International Journal of Knowledge Management (IJKM), 5*(3), 54-72.

Li, W., Ardichvili, A., Maurer, M., Wentling, T., & Stuedemann, R. (2007). Impact of Chinese culture values on knowledge sharing through online communities of practice. *International Journal of Knowledge Management (IJKM), 3*(3), 46-59.

Li, Y., Yan, X., & Song, X. (2015). Motivation for contribution in online health community: An exploratory study.

Liao, C., To, P.-L., & Hsu, F.-C. (2013). Exploring knowledge sharing in virtual communities. *Online Information Review, 37*(6), 891-909.

Liden, R. C., Wayne, S. J., Liao, C., & Meuser, J. D. (2014). Servant leadership and serving culture: Influence on individual and unit performance. *Academy of management Journal, 57*(5), 1434-1452.

Limpisook, N. (2009). Exploring consumers' multi-motives on knowledge sharing in online brand community: The moderating effect of trust, opportunity and ability. 1-95.

Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. *Journal of applied psychology, 86*(1), 114.

Lindner, J. R., & Wingenbach, G. J. (2002). Communicating the handling of nonresponse error in Journal of Extension Research in Brief articles. *Journal of extension, 40*(6), 1-5.

Ling, K., Beenen, G., Ludford, P., Wang, X., Chang, K., Li, X., . . . Rashid, A. M. (2005). Using social psychology to motivate contributions to online communities. *Journal of Computer-Mediated Communication, 10*(4), 00-00.

Lomax, R. G., & Schumacker, R. E. (2004). *A beginner's guide to structural equation modeling*: Psychology Press.

Lu, L., Leung, K., & Koch, P. T. (2006). Managerial knowledge sharing: The role of individual, interpersonal, and organizational factors. *Management and Organization Review, 2*(1), 15-41.

Luarn, P., & Lin, H.-H. (2005). Toward an understanding of the behavioral intention to use mobile banking. *Computers in Human Behavior, 21*(6), 873-891.

Lucas, C. M. (2017). Educational Leaders and Partnerships: A Critical Examination of the GLOBE Model for Higher Education Contexts in the Asia Pacific Region *University-Community Engagement in the Asia Pacific* (pp. 11-19): Springer.

Luther, K. (2012). *Supporting and transforming leadership in online creative collaboration*: Georgia Institute of Technology.

Lynch, J. A., & Friedman, H. H. (2013). Servant leader, spiritual leader: *The case for convergence*. *96*(1), 201.

Ma, M., & Agarwal, R. (2007). Through a glass darkly: Information technology design, identity verification, and knowledge contribution in online communities. *Information Systems Research, 18*(1), 42-67.

Ma, W. W. K., & Yuen, A. H. K. (2010). Understanding online knowledge sharing: An exploratory theoretical framework *Hybrid Learning* (pp. 239-248): Springer.

Maak, T., & Pless, N. M. (2009). Business leaders as citizens of the world. Advancing humanism on a global scale. *Journal of Business Ethics, 88*(3), 537-550.

MacFarlane, A., & O'Reilly-de Brún, M. (2012). Using a theory-driven conceptual framework in qualitative health research. *Qualitative Health Research, 22*(5), 607-618.

Majchrzak, A., Wagner, C., & Yates, D. (2006). *Corporate wiki users: results of a survey*. Paper presented at the Proceedings of the 2006 international symposium on Wikis.

Malhotra, M. K., & Grover, V. (1998). An assessment of survey research in POM: from constructs to theory. *Journal of operations management, 16*(4), 407-425.

Malinen, S. (2015). Understanding user participation in online communities: A systematic literature review of empirical studies. *Computers in Human Behavior, 46*, 228-238.

Mansouri, N. (2016). Moderating Role of the Transformational Leadership in the Relationship between HRM Practices and Performance: A Study of ICT Companies of Malaysia. *Asian Social Science, 12*(7), 1.

Martín-de Castro, G., López-Sáez, P., Delgado-Verde, M., Donate, M. J., & Guadamillas, F. (2011). Organizational factors to support knowledge management and innovation. *Journal of Knowledge Management, 15*(6), 890-914.

Marzano, R. J., Waters, T., & McNulty, B. A. (2005). *School leadership that works: From research to results*: ASCD.

Mayo, E. (2004). *The human problems of an industrial civilization*: Routledge. *96*(1), 201.

McClelland, D. C. (1985). How motives, skills, and values determine what people do. *American psychologist, 40*(7), 812.

McCleskey, J. A. (2014). Situational, transformational, and transactional leadership and leadership development. *Journal of Business Studies Quarterly, 5*(4), 117.

McNeish, J., & Mann, I. J. S. (2010). Knowledge sharing and trust in organizations. *IUP Journal of Knowledge Management, 8*(1/2), 18.

Mesu, J., Sanders, K., & Riemsdijk, M. v. (2015). Transformational leadership and organisational commitment in manufacturing and service small to medium-sized enterprises: The moderating effects of directive and participative leadership. *Personnel Review, 44*(6), 970-990.

Meuser, J. D., Gardner, W. L., Dinh, J. E., Hu, J., Liden, R. C., & Lord, R. G. (2016). A network analysis of leadership theory: The infancy of integration. *Journal of Management, 42*(5), 1374-1403.

Miner, J. B. (2015). Contingency Theory of Leadership: Fred Fiedler *Organizational Behavior 1* (pp. 248-271): Routledge.

Mockus, A., Fielding, R. T., & Herbsleb, J. D. (2002). Two case studies of open source software development: Apache and Mozilla. *ACM Transactions on Software Engineering and Methodology (TOSEM), 11*(3), 309-346.

Mojdeh, S., Head, M., & El Shamy, N. (2018). Knowledge sharing in social networking sites: how context impacts individuals' social and intrinsic motivation to contribute in online communities. *AIS Transactions on Human-Computer Interaction, 10*(2), 82-104

Moorhead, G., & Griffin, R. W. (2012). *Managing organizational behavior*: South-Western Cengage Learning.

Moss Kanter, R. (1972). Commitment and community: Communes and utopias in sociological perspective. *Cambridge, Mass*.

Mumford, M. D., Connelly, S., & Gaddis, B. (2003). How creative leaders think: Experimental findings and cases. *The Leadership Quarterly, 14*(4-5), 411-432.

Nader, R. (1988). Leadership and motivation.

Nawaz, Z., & Khan, I. (2016). Leadership theories and styles: A literature review. *Leadership, 16*, 1-7.

Newman, A., Herman, H., Schwarz, G., & Nielsen, I. (2018). The effects of employees' creative self-efficacy on innovative behavior: The role of entrepreneurial leadership. *Journal of Business Research, 89*, 1-9.

Neubert, M. J., Hunter, E. M., & Tolentino, R. C. (2016). A servant leader and their stakeholders: When does organizational structure enhance a leader's influence? *The Leadership Quarterly, 27*(6), 896-910.

Nguyen, H. N., & Mohamed, S. (2011). Leadership behaviors, organizational culture and knowledge management practices: An empirical investigation. *The Journal of Management Development, 30*(2), 206-221.

Nichols, D. M., & Twidale, M. B. (2002). Usability and open source software. *International Journal of Information Management, 33*(1), 133-146.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization science, 5*(1), 14-37.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*: Oxford university press.

Northouse, P. G. (2016). *Leadership: Theory and practice - Seventh Edition*: Sage publications.

O'Mahony, S., & Ferraro, F. (2007). The emergence of governance in an open source community. *Academy of management Journal, 50*(5), 1079-1106.

Okumbe, J. A. o. (1998). *Educational Management: Theory and Practice*: ERIC. *International Journal of Information Management, 33*(1), 133-146.

Olson, M. J. (1965). The logic of collective action. *Cambridge, MA: Harvard University Press.*

Omilion-Hodges, L. M., & Baker, C. R. (2017). Communicating leader-member relationship quality: The development of leader communication exchange scales to measure relationship building and maintenance through the exchange of communication-based goods. *International Journal of Business Communication, 54*(2), 115-145.

Pallant, J. (2010). SPSS survival manual: A step by step guide to data analysis using SPSS . Maidenhead: Open University Press/McGraw-Hill.

Pallant, J. (2013). *SPSS survival manual*: McGraw-Hill Education (UK).

Palloff, R., & Pratt, K. (1999). Building learning communities in cyberspace. *San Francisco*.

Panaccio, A., Henderson, D. J., Liden, R. C., Wayne, S. J., & Cao, X. (2015). Toward an understanding of when and why servant leadership accounts for employee extra-role behaviors. *J Bus Psychol, 30*(4), 657-675.

Papadopoulos, T., Stamati, T., & Nopparuch, P. (2013). Exploring the determinants of knowledge sharing via employee weblogs. *International Journal of Information Management, 33*(1), 133-146.

Paquin, H., Bank, I., Young, M., Nguyen, L. H., Fisher, R., & Nugus, P. (2018). Leadership in crisis situations: merging the interdisciplinary silos. *Leadership in Health Services, 31*(1), 110-128.

Parris, D. L., & Peachey, J. W. (2013). A systematic literature review of servant leadership theory in organizational contexts. *Journal of Business Ethics, 113*(3), 377-393.

Pearl, D. K., & Fairley, D. (1985). Testing for the potential for nonresponse bias in sample surveys. *Public opinion quarterly, 49*(4), 553-560.

Peng, D. X., & Lai, F. (2012). Using partial least squares in operations management research: A practical guideline and summary of past research. *Journal of operations management, 30*(6), 467-480.

Pfeffer, J., Cialdini, R. B., Hanna, B., & Knopoff, K. (1998). Faith in supervision and the self-enhancement bias: Two psychological reasons why managers don't empower workers. *Basic and Applied Social Psychology, 20*(4), 313-321.

Phillips, R. (2017). Wordpress: An Ultimate Guide To The Internet's Best Publishing Platform A Complete Beginners Guide To Building and Designing Your Own Website.

Pi, S.-M., Chou, C.-H., & Liao, H.-L. (2013). A study of Facebook Groups members' knowledge sharing. *Computers in Human Behavior, 29*(5), 1971-1979.

Pittinsky, M. S. (2003). *The wired tower: Perspectives on the impact of the internet on higher education*: FT Press.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of applied psychology, 88*(5), 879.

Podsakoff, P. M., MacKenzie, S. B., Moorman, R. H., & Fetter, R. (1990). Transformational leader behaviors and their effects on followers' trust in leader, satisfaction, and organizational citizenship behaviors. *The Leadership Quarterly, 1*(2), 107-142.

Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management, 12*(4), 531-544.

Polonsky, M. J., & Waller, D. S. (2014). *Designing and managing a research project: A business student's guide*: Sage Publications.

Preece, J. (2000). *Online communities: Designing usability and supporting socialbilty*: John Wiley & Sons, Inc.

Preece, J., Nonnecke, B., & Andrews, D. (2004). The top five reasons for lurking: improving community experiences for everyone. *Computers in Human Behavior, 20*(2), 201-223.

Preece, J., & Shneiderman, B. (2009). The reader-to-leader framework: Motivating technology-mediated social participation. *AIS Transactions on Human-Computer Interaction, 1*(1), 13-32.

Qin, X., Salter-Townshend, M., & Cunningham, P. (2014). *Exploring the Relationship between Membership Turnover and Productivity in Online Communities.* Paper presented at the ICWSM.

Rabbani, S., Imran, R., Shamoon, S., & Kamal, N. (2017). Directive Leadership and Satisfaction: A Unique Relationship. *Advanced Science Letters, 23*(1), 337-340.

Rahman, M. S., Mannan, M., Hossain, M. A., Zaman, M. H., & Hassan, H. (2018). Tacit knowledge sharing behavior among the academic staff: trust, self-efficacy, motivation and Big Five personality traits embedded model. *International Journal of Educational Management*(just-accepted), 00-00.

Rana, N. P., & Dwivedi, Y. K. (2015). Citizen's adoption of an e-government system: Validating extended social cognitive theory (SCT). *Government Information Quarterly, 32*(2), 172-181.

Ransbotham, S., & Kane, G. C. (2011). Membership turnover and collaboration success in online communities: Explaining rises and falls from grace in Wikipedia. *MIS quarterly*, 613-627.

Rapp, A., Ahearne, M., Mathieu, J., & Schillewaert, N. (2006). The impact of knowledge and empowerment on working smart and working hard: The moderating role of experience. *International journal of research in marketing, 23*(3), 279-293.

Raven, B. H., & Fishbein, M. (1965). Social referents and self-evaluation in examinations. *The Journal of social psychology, 65*(1), 89-99.

Reagle Jr, J. M. (2007). *Do as I do:: authorial leadership in wikipedia.* Paper presented at the Proceedings of the 2007 international symposium on Wikis.

Redmond, M. R., Mumford, M. D., & Teach, R. (1993). Putting creativity to work: Effects of leader behavior on subordinate creativity. *Organizational behavior and human decision processes, 55*(1), 120-151.

Reinartz, W., Haenlein, M., & Henseler, J. (2009). An empirical comparison of the efficacy of covariance-based and variance-based SEM. *International journal of research in marketing, 26*(4), 332-344.

Ren, Y., Kraut, R., & Kiesler, S. (2007). Applying common identity and bond theory to design of online communities. *Organization studies, 28*(3), 377-408.

Rheingold, H. (2000). *The virtual community: Homesteading on the electronic frontier*: MIT press.

Riaz, M. N., & Khalili, M. T. (2014). Transformational,Transactional Leadership and Rational Decision Making in Services Providing Organizations: Moderating Role of Knowledge Management Processes. *Pakistan Journal of Commerce & Social Sciences, 8*(2), 355-364.

Richter, G., Raban, D. R., & Rafaeli, S. (2015). Studying gamification: the effect of rewards and incentives on motivation *Gamification in education and business* (pp. 21-46): Springer.

Ridings, C. M., Gefen, D., & Arinze, B. (2002). Some antecedents and effects of trust in virtual communities. *The Journal of Strategic Information Systems, 11*(3), 271-295.

Riel, M., & Polin, L. (2004). Learning communities: Common ground and critical differences in designing technical support. *Designing for virtual communities in the service of learning*, 16-52.

Rigdon, E. E., Schumacker, R. E., & Wothke, W. (1998). A comparative review of interaction and nonlinear modeling. *Interaction and nonlinear effects in structural equation modeling*, 1-16.

Ringle, C. M., Sarstedt, M., & Straub, D. W. (2012). Editor's Comments: A Critical Look at the Use of PLS-SEM in" MIS Quarterly". *MIS quarterly*, iii-xiv.

Ringle, C. M., Wende, S., & Will, A. (2005). SmartPLS 2.0. Hamburg.

Rogers, E. M., Hart, W. B., & Dearing, J. W. (1997). A paradigmatic history of agenda-setting research. *Do the media govern*, 225-236.

Ross, J. J. W. (2009). Peer Leadership in a Virtual Community of Practice. *Master Thesis* , University of Exeter

Safadi, H., & Berente, N. (2019). *Legitimate Peripheral Participation and Value Creation in Online Knowledge Sharing Communities.* Paper presented at the Proceedings of the 52nd Hawaii International Conference on System Sciences.

Santosh, B., & Muthiah, K. (2012). Knowledge transfer from repatriated employees: the Indian experience. *IUP Journal of Knowledge Management, 10*(1), 7.

Sashkin, M. (1976). Changing toward participative management approaches: A model and method. *Academy of management Review, 1*(3), 75-86.

Saunders, M. N. (2011). *Research methods for business students, 5/e*: Pearson Education India.

Schafer, J. L. (1999). Multiple imputation: a primer. *Statistical methods in medical research, 8*(1), 3-15.

Schwartz, A., & Timbolschi-Preoteasa, M. (2015). Transparency in the era of the Internet Internet Service Providers-the new gatekeepers of communication. *Revista Româna de Jurnalism si Comunicare, 10*(2), 33.

Scully, J. A., Kirkpatrick, S. A., & Locke, E. A. (1995). Locus of knowledge as a determinant of the effects of participation on performance, affect, and perceptions. *Organizational behavior and human decision processes, 61*(3), 276-288.

Sekaran, U., & Bougie, R. (2011). Research method for business: A skill building approach: Taylor & Francis.

Sekaran, U., & Bougie, R. (2013). Research Methods For Business. United Kingdom: New York: John Wiley & Sons, Inc.

Sharma, P. N., & Pearsall, M. J. (2016). Leading under adversity: Interactive effects of acute stressors and upper-level supportive leadership climate on lower-level supportive leadership climate. *The Leadership Quarterly, 27*(6), 856-868.

Sheikh, K., & Mattingly, S. (1981). Investigating non-response bias in mail surveys. *Journal of Epidemiology & Community Health, 35*(4), 293-296.

Sheng, M., & Hartono, R. (2015). An exploratory study of knowledge creation and sharing in online community: A social capital perspective. *Total Quality Management & Business Excellence, 26*(1-2), 93-107.

Sherony, K. M., & Green, S. G. (2002). Coworker exchange: relationships between coworkers, leader-member exchange, and work attitudes. *Journal of applied psychology, 87*(3), 542.

Shin, S. J., & Zhou, J. (2003). Transformational leadership, conservation, and creativity: Evidence from Korea. *Academy of management Journal, 46*(6), 703-714.

Singh, S. K. (2008). Role of leadership in knowledge management: a study. *Journal of Knowledge Management, 12*(4), 3-15. doi:10.1108/13673270810884219

Small, E. E., & Rentsch, J. R. (2011). Shared leadership in teams. *Journal of Personnel Psychology*.

Sonnenbichler, A. C. (2010). A community membership life cycle model. *arXiv preprint arXiv:1006.4271*.

Sosik, J. J., Kahai, S. S., & Piovoso, M. J. (2009). Silver bullet or voodoo statistics? A primer for using the partial least squares data analytic technique in group and organization research. *Group & Organization Management, 34*(1), 5-36.

Spector, P. E. (2006). Method variance in organizational research: truth or urban legend? *Organizational research methods, 9*(2), 221-232.

Spreitzer, G. M. (1995). Psychological empowerment in the workplace: Dimensions, measurement, and validation. *Academy of management Journal, 38*(5), 1442-1465.

Squire, K. D., & Johnson, C. B. (2000). Supporting distributed communities of practice with interactive television. *Educational Technology Research and Development, 48*(1), 23-43.

Sreejesh, S., Mohapatra, S., & Anusree, M. (2014). *Business research methods*: Springer.

Stenmark, D. (2002). *Information vs. knowledge: The role of intranets in knowledge management.* Paper presented at the System Sciences, 2002. HICSS. Proceedings of the 35th Annual Hawaii International Conference on.

Stevens, J. (1992). Applied multivariate statistics for the social sciences. ERlbaum. *Hillsdale, NJ. Organizational behavior and human decision processes, 61*(3), 276-288.

Stevens, J. P. (2012). *Applied multivariate statistics for the social sciences*: Routledge.

Straub, D., Boudreau, M.-C., & Gefen, D. (2004). Validation guidelines for IS positivist research. *The Communications of the Association for Information Systems, 13*(1), 63.

Straub, D. W. (1989). Validating instruments in MIS research. *MIS quarterly*, 147-169.

Suh, A., & Shin, K.-S. (2010). Exploring the effects of online social ties on knowledge sharing: A comparative analysis of collocated vs dispersed teams. *Journal of Information Science, 36*(4), 443-463.

Sun, Y. (2014). Janet Sternberg, Misbehavior in Cyber Places: The Regulation of Online Conduct in Virtual Communities on the Internet. *International Journal of Communication, 8*, 3.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics*: Allyn & Bacon/Pearson Education.

Tapscott, D., & Williams, A. D. (2008). *Wikinomics: How mass collaboration changes everything*: Penguin.

Tenenhaus, M., Vinzi, V. E., Chatelin, Y.-M., & Lauro, C. (2005). PLS path modeling. *Computational statistics & data analysis, 48*(1), 159-205.

Thackeray, R., Neiger, B. L., Smith, A. K., & Van Wagenen, S. B. (2012). Adoption and use of social media among public health departments. *BMC public health, 12*(1), 242.

Tharenou, P., Donohue, R., & Cooper, B. (2007). *Management research methods*: Cambridge University Press New York, NY.

Thomas, K. W., & Velthouse, B. A. (1990). Cognitive elements of empowerment: An "interpretive" model of intrinsic task motivation. *Academy of management Review, 15*(4), 666-681.

Thomas, L., Herbert, J., & Teras, M. (2014). A sense of belonging to enhance participation, success and retention in online programs.

Tickle, E. L., Brownlee, J., & Nailon, D. (2005). Personal epistemological beliefs and transformational leadership behaviours. *Journal of Management Development, 24*(8), 706-719.

Tierney, P., Farmer, S. M., & Graen, G. B. (1999). An examination of leadership and employee creativity: The relevance of traits and relationships. *Personnel psychology, 52*(3), 591-620.

Ting, H., de Run, E. C., & Liew, S. L. (2016). Intention to use Instagram by generation cohorts: The perspective of developing markets. *Global Business and Management Research, 8*(1), 43.

Trochim, W. M. (2006). Nonprobability sampling. *Research methods knowledge base, 1*(1), 1-10.

Trust, T., Krutka, D. G., & Carpenter, J. P. (2016). "Together we are better": Professional learning networks for teachers. *Computers & Education, 102*, 15-34.

Tseng, F.-C., & Kuo, F.-Y. (2014). A study of social participation and knowledge sharing in the teachers' online professional community of practice. *Computers & Education, 72*, 37-47.

Tuckey, M. R., Bakker, A. B., & Dollard, M. F. (2012). Empowering leaders optimize working conditions for engagement: A multilevel study. *Journal of occupational health psychology, 17*(1), 15.

Uhl-Bien, M., Riggio, R. E., Lowe, K. B., & Carsten, M. K. (2014). Followership theory: A review and research agenda. *The Leadership Quarterly, 25*(1), 83-104.

Urbach, N., & Ahlemann, F. (2010). Structural equation modeling in information systems research using partial least squares. *JITTA: Journal of Information Technology Theory and Application, 11*(2), 5.

Uszynski, M., Casey, B., Hayes, S., Gallagher, S., Purtill, H., Motl, R. W., & Coote, S. (2016). Demographic and Social Cognitive Theory Correlates of Energy Expenditure in Inactive Adults With Multiple Sclerosis. *Archives of Physical Medicine and Rehabilitation, 97*(10), e100.

Van den Hooff, B., & de Leeuw van Weenen, F. (2004). Committed to share: commitment and CMC use as antecedents of knowledge sharing. *Knowledge and process management, 11*(1), 13-24.

Van Dierendonck, D. (2011). Servant leadership: A review and synthesis. *Journal of Management, 37*(4), 1228-1261.

Van Dierendonck, D., Stam, D., Boersma, P., De Windt, N., & Alkema, J. (2014). Same difference? Exploring the differential mechanisms linking servant leadership and transformational leadership to follower outcomes. *The Leadership Quarterly, 25*(3), 544-562.

Van Quaquebeke, N., & Felps, W. (2018). Respectful inquiry: A motivational account of leading through asking questions and listening. *Academy of management Review, 43*(1), 5-27.

Vecchio, R. P., Justin, J. E., & Pearce, C. L. (2010). Empowering leadership: An examination of mediating mechanisms within a hierarchical structure. *The Leadership Quarterly, 21*(3), 530-542.

Vinzi, V. E., Lauro, C. N., & Amato, S. (2005). PLS typological regression: algorithmic, classification and validation issues *New developments in classification and data analysis* (pp. 133-140): Springer.

Verardi, V., & Croux, C. (2008). Robust regression in Stata. *The Journal of Strategic Information Systems, 9*(2), 155-173.

von Krogh, G., Nonaka, I., & Rechsteiner, L. (2012). Leadership in Organizational Knowledge Creation: A Review and Framework. *Journal of Management Studies, 49*(1), 240-277. doi:10.1111/j.1467-6486.2010.00978.x

Vroom, V. H., & Jago, A. G. (2007). The role of the situation in leadership. *American psychologist, 62*(1), 17.

Wah, C. Y., Loh, B., Menkhoff, T., & Evers, H.-D. (2005). *Theorizing, measuring, and predicting knowledge sharing behavior in organizations-a social capital approach.* Paper presented at the Proceedings of the 38th Annual Hawaii International Conference on System Sciences.

Wallace, P. (2004). *The Internet in the workplace: How new technology is transforming work*: Cambridge University Press.

Walter, F., Cole, M. S., der Vegt, G. S. v., Rubin, R. S., & Bommer, W. H. (2012). Emotion recognition and emergent leadership: Unraveling mediating mechanisms and boundary conditions. *The Leadership Quarterly, 23*(5), 977-991. doi:10.1016/j.leaqua.2012.06.007

Walter, F., & Scheibe, S. (2013). A literature review and emotion-based model of age and leadership: New directions for the trait approach. *The Leadership Quarterly, 24*(6), 882-901.

Wang, & Lantzy, S. (2011). *A systematic examination of member turnover and online community health.* Paper presented at the ICIS 2011 Proceedings.

Wang, S., & Noe, R. A. (2010). Knowledge sharing: A review and directions for future research. *Human Resource Management Review, 20*(2), 115-131.

Wang, W.-T., & Hou, Y.-P. (2015). Motivations of employees' knowledge sharing behaviors: A self-determination perspective. *Information and Organization, 25*(1), 1-26.

Wasko, M. M., & Faraj, S. (2000). "It is what one does": why people participate and help others in electronic communities of practice. *The Journal of Strategic Information Systems, 9*(2), 155-173.

Wasko, M. M., & Faraj, S. (2005). Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS quarterly*, 35-57.

Wellman, B., & Gulia, M. (1999). Net surfers don't ride alone: Virtual communities as communities. *Networks in the global village*, 331-366.

Wellman, B., & Gulia, M. (2018). Net-surfers don't ride alone: Virtual communities as communities *Networks in the global village* (pp. 331-366): Routledge.

Wenger, E. (1998). Communities of practice: Learning as a social system. *Systems thinker, 9*(5), 2-3.

Wenger, E. (1999). *Communities of practice: Learning, meaning, and identity*: Cambridge university press.

Wenger, E., McDermott, R. A., & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge*: Harvard Business Press.

Wetzels, M., Odekerken-Schröder, G., & Van Oppen, C. (2009). Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS quarterly*, 177-195.

Wilden, R., Gudergan, S. P., Nielsen, B. B., & Lings, I. (2013). Dynamic capabilities and performance: strategy, structure and environment. *Long Range Planning, 46*(1-2), 72-96.

Wold, H. (1985). Partial least squares. *Encyclopedia of statistical sciences*.

Wright, K. B. (2005). Researching Internet-based populations: Advantages and disadvantages of online survey research, online questionnaire authoring software packages, and web survey services. *Journal of Computer-Mediated Communication, 10*(3), 00-00.

Wu, C.-H., & Parker, S. K. (2017). The role of leader support in facilitating proactive work behavior: A perspective from attachment theory. *Journal of Management, 43*(4), 1025-1049.

Xiao, Y., Zhang, X., & Ordóñez de Pablos, P. (2017). How does individuals' exchange orientation moderate the relationship between transformational leadership and knowledge sharing? *Journal of Knowledge Management, 21*(6), 1622-1639.

Xu, B., Jones, D. R., & Shao, B. (2009). Volunteers' involvement in online community based software development. *Information & Management, 46*(3), 151-158.

Yaghoubi, H., Mahallati, T., Safari Moghadam, A., & Rahimi, E. (2014). Transformational Leadership: Enabling Factor of Knowledge Management Practices. *Journal of Management and Sustainability, 4*(3). doi:10.5539/jms.v4n3p165

Yammarino, F. J., & Naughton, T. J. (1992). Individualized and group-based views of participation in decision making. *Group & Organization Management, 17*(4), 398-413.

Yang, J.-T. (2007). Knowledge sharing: Investigating appropriate leadership roles and collaborative culture. *Tourism Management, 28*(2), 530-543. doi:10.1016/j.tourman.2006.08.006

Ye, Y., & Kishida, K. (2003). *Toward an understanding of the motivation Open Source Software developers.* Paper presented at the Proceedings of the 25th international conference on software engineering.

Yoo, Y., & Alavi, M. (2004). Emergent leadership in virtual teams: what do emergent leaders do? *Information and Organization, 14*(1), 27-58. doi:10.1016/j.infoandorg.2003.11.001

Yuan, Y. C., Cosley, D., Welser, H. T., & Xia, L. (2009). The diffusion of a task recommendation system to facilitate contributions to an online community. *Journal of Computer-Mediated Communication, 15*(1), 32-59.

Yukl, G. (1999). An evaluation of conceptual weaknesses in transformational and charismatic leadership theories. *The Leadership Quarterly, 10*(2), 285-305.

Yukl, G. (2006). Leadership in Organizations, Pearson Education. *New Jersey*.

Yukl, G., O'Donnell, M., & Taber, T. (2009). Influence of leader behaviors on the leader-member exchange relationship. *Journal of Managerial Psychology, 24*(4), 289-299.

Yukselturk, E., & Bulut, S. (2009). Gender differences in self-regulated online learning environment. *Journal of Educational Technology & Society, 12*(3), 12.

Zhang, X., Zhang, Y., Sun, Y., Lytras, M., Ordonez de Pablos, P., & He, W. (2017). Exploring the effect of transformational leadership on individual creativity in e-learning: a perspective of social exchange theory. *Studies in Higher Education*, 1-15.

Zhang, Y., & Hiltz, S. R. (2003). Factors that influence online relationship development in a knowledge sharing community. *AMCIS 2003 proceedings*, 53.

Zhu, H., Kraut, R. E., & Kittur, A. (2013). Effectiveness of Shared Leadership in Wikipedia. *Human Factors: The Journal of the Human Factors and Ergonomics Society, 55*(6), 1021-1043. doi:10.1177/0018720813515704

Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013). *Business research methods*: Cengage Learning.

Appendix A

Web Survey Questionnaire

Section A

Dear Respondents,

My name is Abdul Razak Faiek, a postgraduate student at Universiti Utara Malaysia. I am conducting a study on a research titled "Examining Virtual Leadership Behavior towards Knowledge Sharing in Online Programming Communities". This survey has two sections. Section A and section B. It will take approximately 5 - 10 minutes to complete the survey.

Before answering the survey, please go through our definition of "influential member", “knowledge sharing” and “online programming community”.

Influential Members: A person whose ideas, opinions, knowledge, skills or characteristics that trigger you to participate and strongly influence your existence in this Online Programming Communities. These members also are willing to guide you towards a common goal and belief to realize the vision.

Knowledge Sharing: Members’ action of posting what they know using the online community platform. Knowledge sharing/contribution in the community can be in the form of:

1. Posting new project/articles/coding/threads.
2. Posting answers (e.g.: solution, feedback, opinion).

Online Programming Community is an online community platform for programmers and open source software enthusiast that provide a place to connect, build and share knowledge and learning to develop websites, apps, programs, and games.

All responses are **treated anonymous and will be strictly confidential**. Your cooperation and willingness to participate in this survey is highly appreciated. If you have any inquiries regarding the study, you can contact me at 0135007022 or email me at qazakian@gmail.com

Please provide information about your background for our study by answering the following questions. This information is important to allow us to study the effects of differences among individuals on their perceptions of their Online Programming Communities. (Tick where necessary).

1. [Lucky Draw Prize]
   Please insert your email address to reach you for delivering the prize

   Email [**Optional**]:

2. Have you participated in any Online Programming Communities?
   - ☐ Yes
   - ☐ No

3. Which Online Programming Community do you most actively participate in?
   - ☐ JavaScript Programming Community
   - ☐ SQL Programming Community
   - ☐ Java Programming Community
   - ☐ C# Programming Community
   - ☐ Python Programming Community
   - ☐ PHP Programming Community
   - ☐ C++ Programming Community
   - ☐ C Programming Community
   - ☐ TypeScript Programming Community
   - ☐ Ruby Programming Community
   - ☐ Swift Programming Community
   - ☐ Objective-C Programming Community
   - ☐ VB.NET Programming Community
   - ☐ Assembly Programming Community
   - ☐ R Programming Community
   - ☐ Perl Programming Community
   - ☐ CSS Programming Community
   - ☐ Matlab Programming Community
   - ☐ Visual Basic Programming Community
   - ☐ Go Programming Community
   - ☐ Other (please specify)

4. How long have you been in this online programming community?
   - ☐ Less than 1 year
   - ☐ 1 to 3 years
   - ☐ 3 to 5 years
   - ☐ 5 to 7 years
   - ☐ More than 7 years

5. Please name the most influential members of the online programming community answered in Q3?
   [Optional]
   For example (Jon Skeet, An Wang, Zaidoun Karadsheh, Anubhava)

6. How frequently do you visit this Online Programming Community?
   - Everyday
   - More than once a week
   - More than once a month
   - More than once a year
   - Less than once a year
   - Rarely
   - Never

7. In average, how often do you post in this Online Programming Community?
   - Everyday
   - More than once a week
   - More than once a month
   - More than once a year
   - Once a year or less
   - Rarely
   - Never

8. What is your Role in this Online Programming Community?
   - Beginner
   - Intermediate
   - Advanced
   - Expert
   - Moderator/Administrator/Community Manager

9. What is your gender?
   - Male
   - Female

10. What is your age?
    - 13-20 years
    - 21-30 years
    - 31-40 years
    - 41-50 years
    - 51-60 years
    - Over 61 years

11. What is the highest level of education that you have completed?
    - Primary School
    - Secondary School
    - Diploma
    - Bachelor's Degree
    - Master's Degree
    - Doctor of Philosophy (PhD)

Section B : Items
(Scale : Strongly Disagree (1) – Strongly Agree (5)

Self-Efficacy: Please indicate your level of agreement with each statement below that best reflects what you think about sharing knowledge in the community, on a scale from 1 (Strongly Disagree) to 5 (Strongly Agree).

1. I am confident in responding to other members' post in this Online Programming Community.
2. The knowledge I share with members of this Online Programming Community should be useful to them.
3. I am confident in giving guidance to questions asked by members of this Online Programming Community.
4. I am confident that my knowledge sharing would help this Online Programming Community to achieve its goals.
5. I am confident in providing my opinion to others by engaging in dialogue with other members in this Online Programming Community.

Outcome expectancy: This section asks you about your expected outcomes from community activities. Please indicate your level of expectations, on a scale from 1 (No impact) to 5 (Great deal).

1. My knowledge sharing will strengthen the tie between me and other members in this Online Programming Community.
2. Sharing my knowledge can enhance my reputation in this Online Programming Community.
3. Gaining useful information from this Online Programming Community will help me spend less time on routine job tasks.
4. Sharing my knowledge will give me a sense of accomplishment.
5. If I share my knowledge with other Online Programming Community members, I will get better cooperation and benefits in return.
6. Sharing my knowledge will help me meet other people with similar interests in this Online Programming Community.
7. Using knowledge from this Online Programming Community will enable me to accomplish my tasks more efficiently.

The Supportive Leadership behavior:
This section asks you about the most influential members' supportive leadership behavior in online programming community. Please indicate your level of agreement with each statement below.

1. The most influential members help me find meaning of my existences in this Online Programming Community.
2. The most influential members keen to satisfy my inquiries posted in this Online Programming Community.
3. The most influential members give positive feedback when I contribute to this Online Programming Community.
4. The most influential members of this Online Programming Community encourage me when I needed support.
5. The most influential members provide a clear vision of my existence in this Online Programming Community.

Directive Leadership Behavior :
This section asks you about the most influential members' directive leadership behavior in online programming community. Please indicate your level of agreement with each statement below.

1. The most influential members let me know what is expected from me in this Online Programming Community.
2. The most influential members inform me the standard rules and regulations that I have to follow in online programming community.
3. The most influential members explain what and how I can contribute to this Online Programming Community.

Participative Leadership Behavior :
This section asks you about the most influential members' participative leadership behavior in online programming community. Please indicate your level of agreement with each statement below.

1. The most influential members listen receptively to my ideas and suggestions.
2. The most influential members consult me when I share my ideas in this Online Programming Community.
3. The most influential members always ask for my suggestions concerning on how to enhance community contribution in this Online Programming Community.
4. The most influential members will let me participate in making decisions on enhancing this online community.

Achievement-oriented Leadership Behavior:
This section asks you about the most influential members' Achievement-oriented leadership behavior in online programming community. Please indicate your level of agreement with each statement below.

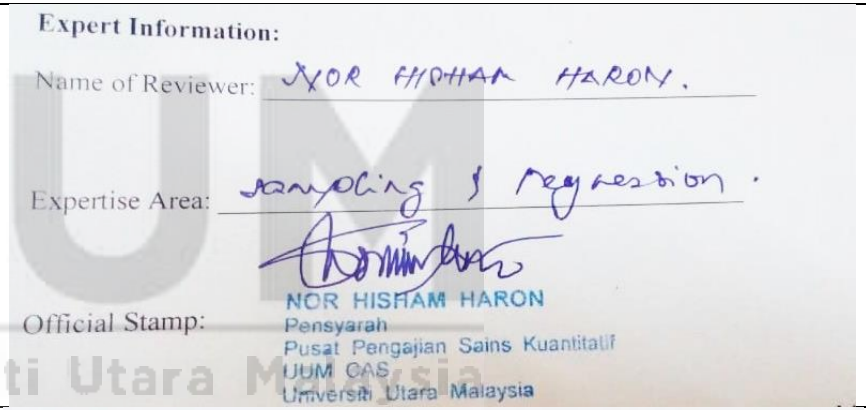
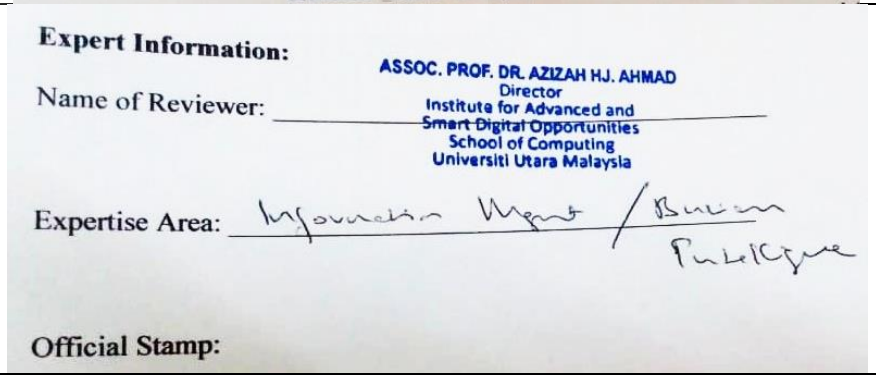
1. The most influential members made me aware that participation in this Online Programming Community is beneficial and rewarding.
2. The most influential members set challenging goals for my contribution in this Online Programming Community.
3. The most influential members encourage my continual contribution in this Online Programming Community.

Knowledge Sharing Behaviors: This section asks you about your knowledge sharing behaviors in the online programming community. Please indicate your level of agreement with each statement below.

1. I share my knowledge with members of this Online Programming Community.
2. I make valuable information available to all other members in this Online Programming Community.
3. I often ask for advice and information in this Online Programming Community that can help me solve problems in my work.
4. I try to stay updated by exploring all the information available in this Online Programming Community.
5. I contribute my ideas by participating in one or more discussion in this Online Programming Community.
6. I help other members find solutions to their problems in this Online Programming Community.

Appendix B

List of Experts Involved in This Study

Expert Information	Evidences
Expert 1. **FACE VALIDITY** Name: Nor Hisham Haron Department: Pusat Pengajian Sains Kuantitative, UUM. Position: Senior Lecturer/ Statistical consultant Expertise: Sampling & Regression	
Expert 2. **CONTENT VALIDITY** Name: Assoc. Prof. Dr. Azizah Hj. Ahmad Department: School of Computing, UUM. Position: Senior Lecturer Expertise: Information Management	

Expert 3. **CONTENT VALIDITY** Name: Dr. Mazida Ahmad Department: School of Computing, UUM. Position: Senior Lecturer Expertise: Knowledge Management	**Expert Information:** Name of Reviewer: Mazida Ahmad Expertise Area: Knowledge Management Official Stamp: DR. MAZIDA BT AHMAD Pensyarah Kanan Pusat Pengajian Pengkomputeran UUM College of Arts and Sciences Universiti Utara Malaysia
Expert 4. **CONTENT VALIDITY** Name: Dr Alawiyah Abdul Wahab Department: School of Computing, UUM. Position: Senior Lecturer Expertise: E-Learning, E-commerce & Internet Application	**Expert Information:** Name of Reviewer: Alawiyah Abd Wahab Expertise Area: E-learning, E-commerce & Internet Applications Official Stamp: DR. ALAWIYAH ABD WAHAB Senior Lecturer School of Computing UUM College of Arts and Sciences Universiti Utara Malaysia
Expert 5. **CONTENT VALIDITY** Name: Dr. Ishola D. Muraina Department: School of Computing, UUM. Position: Visiting Senior Lecturer Expertise: Information technology & Digital Information	**Expert Information:** Name of Reviewer: Dr. Ishola D. Muraina Expertise Area: Information Technology & Digital Information Official Stamp: DR. ISHOLA DADA MURAINA Visiting Senior Lecturer School of Computing UUM College of Arts and Sciences Universiti Utara Malaysia